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MEMORANDA ON VENEREAL DISEASES

1936

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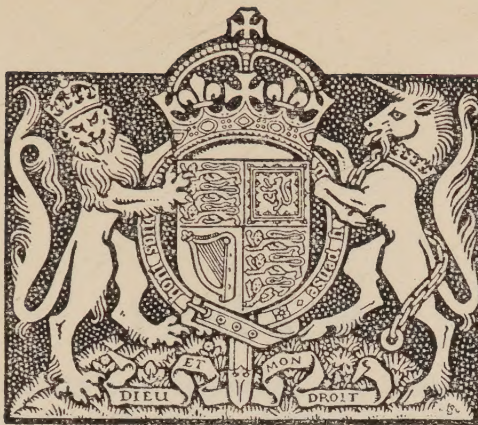
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PREFACE

These Memoranda are intended for reference by Medical Officers serving at home and abroad and for the training of special treatment orderlies.

They were compiled by Lieutenant-Colonel H. G. Winter, M.C., R.A.M.C. Free use has been made of the Pamphlet on Venereal Diseases (2nd edition), issued by the Director of Medical Services in India in 1923.

Acknowledgment is due to the authors of the following books, from the text of which quotations have been taken :—

“ The Diagnosis and Treatment of Venereal Diseases in General Practice,” by Colonel L. W. Harrison ; “ Diagnosis and Treatment of Venereal Diseases,” by Dr. David Lees ; and “ Handbook on Venereal Diseases for Nurses,” by Mr. W. Turner-Warwick.

J. A. HARTIGAN,
Lieutenant-General,
Director-General,
Army Medical Services.

THE WAR OFFICE,
8th April, 1936.

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CHAPTER I

ORGANIZATION OF A VENEREAL DIVISION

1. Venereal diseases are those which are contracted during sexual intercourse with an infected person. They are three in number and are known as SYPHILIS, GONORRHOEA and SOFT CHANCER. These diseases are contagious, *i.e.* they are capable of being communicated from one person to another by contact. It is therefore extremely important that individuals suffering from any of these diseases should be accommodated apart from other patients. In every modern hospital where such cases are treated a separate section is reserved for this purpose and is known as the "VENEREAL DIVISION."

It is also of importance that, where possible, cases suffering from one disease should be accommodated apart from those suffering from another and that separate W.Cs., etc., should be provided for each disease. All patients must be warned of the danger of contagion.

A good arrangement is for all cases of undiagnosed sores to be in one part of the ward and as soon as a case is diagnosed syphilis the patient should be moved to that part allotted to the disease; similarly, undiagnosed urethritis should be kept apart from definite gonorrhœa. Where separate wards are available for each category, so much the better.

2. Care must be taken in a ward where only one bath exists. The orderly is responsible that the bath is thoroughly cleansed and disinfected after use with an antiseptic solution consisting of one and a half ounces of cresol to the gallon of water. The best bathing arrangements in venereal divisions are hot and cold showers; they are free from the risk of spreading infection. As, however, medicated baths have frequently to be given to certain patients, at least one long bath of the usual "slipper" pattern should be installed in every venereal division for this purpose.

The orderly in charge should keep a bath roll showing the full particulars of every patient in each ward and will arrange for a certain number of patients to bathe each day and ensure that each patient has a bath at least once a week. It should be so arranged that syphilis patients bathe on days when others are not bathing. Each patient should initial the bath roll immediately after taking his bath.

3. An important duty in the routine of venereal divisions is to ascertain that every patient reads and understands all orders referring to patients in hospital and especially those for patients in a venereal division. This is necessary for the maintenance of the high standard of discipline desirable amongst venereal patients. For this purpose an order book should be kept in the division showing each patient's full particulars. Each page should be headed by a short certificate, viz. :—

“Certified that I have read and thoroughly understand orders for patients in hospital and those relating to the venereal division.”

A column will be reserved for the signature of patients after they have read the orders. This procedure will render any excuse (based on alleged ignorance of orders) unavailing. One book is sufficient for a division ; it should be kept in the duty bunk of the reception ward and may be passed to other wards as required.

4. The marking and disinfecting of hospital bedding and clothing used by venereal patients are matters that must receive careful attention. Clothing is marked with a large “V” to prevent such articles being issued to or used by patients in hospital suffering from other diseases. The linen store keeper is responsible that articles marked “V” are kept apart from those intended for other patients.

A supply of sheets, pillow-slips, shirts, drawers, handkerchiefs and towels, distinctly marked with the letter “V,” will, when necessary, be set apart for the use of patients suffering from venereal disease.

When no steam disinfector is available, the articles marked “V” will invariably be steeped in a $2\frac{1}{2}$ per cent. solution of cresol for half an hour and subsequently rinsed thoroughly in clean water before being sent to the laundry or contractor for washing. All feeding utensils intended for the use of syphilitic patients should be marked with a “V” and kept solely for their use.

All articles of bedding and clothing must be disinfected before being sent to the laundry. Dirty articles must never be allowed to remain in the wards. As soon as a change has been carried out, such articles will be taken direct to the disinfecting chamber without delay ; on no account will such articles be returned to the linen store before this has been done. Disinfection is normally carried out in the steam disinfector, where articles are exposed to the action of steam under pressure for twenty minutes. This pressure raises the boiling point of water from 212° F. to 218° F., and assists in the penetration of the steam into the article exposed.

Steam disinfection damages leather, fur, etc. Clothing with leather strappings, rubber material, etc., should not, therefore, be disinfected by steam but should be sprayed with formalin and exposed to the air.

In small hospitals where a steam disinfector is not used, the articles should be treated as follows :—

A large tub or other vessel, marked with a large red “ V,” containing a solution of 4 oz. of cresol to the gallon, should be kept. The articles should be steeped in this solution for at least half an hour. After this they must be thoroughly rinsed in clean water and dried before being sent to the laundry. (*See Regulations for the Medical Services of the Army, 1932, paras. 596 and 601.*)

5. The regimental clothing of patients admitted to the venereal division is taken to the disinfector before being handed to the pack-store, where such articles as shirts, socks, etc., are separated for washing purposes. Articles of cutlery and crockery for use of venereal patients must also be kept apart in the linen and utensil store. In the case of “ V ” crockery, a sound method is to arrange for holding on charge in the ward complete sets of utensils in accordance with the number of beds equipped. Feeding utensils intended for the use of syphilitic patients should be marked with a “ V ” and kept solely for their use.

6. While in hospital patients suffering from syphilis and gonorrhœa will be in possession of a card of instructions to patients suffering from venereal disease—A.F. I 1242 for syphilis and A.F. I 1243 for gonorrhœa. These instructions are issued in accordance with Regulations for the Medical Services of the Army, 1932, para. 117. The cards should be issued with the patient's kit on admission to hospital, and handed in on discharge. The ward orderly is responsible that each patient is in possession of the card which refers to his disease and will see that the card is kept on the patient's bed board. When cards have been defaced, fresh copies can be obtained from the divisional office.

7. As soon as a patient has been admitted to a ward, the orderly will see that he obtains his full hospital kit. The patient will be warned to bathe and change into his hospital clothing. The regimental clothing must be handed in for disinfection. The patient should then be taken to the treatment room or laboratory, whichever applies, for a smear examination in the case of gonorrhœa or a dark ground examination in the case of syphilis or a sore.

The orderly will prepare A.F. F 734 and draw a subsistence diet for the patient from the steward.

When a case of venereal sore is admitted to the ward after duty hours, the orderly will dress the sore with normal saline pending examination by the medical officer the following morning. In no circumstances must any form of antiseptic be applied to a sore except under the orders of a medical officer (*see* para. 126).

Cases of suspected gonorrhœa should be given calomel, grs. 3, on admission, to be followed by a dose of *mist. alba*, oz. 1, the following morning, under the orders of the medical officer, as a routine. Gonorrhœa patients are invariably confined to bed on a milk diet on admission.

8. A modern venereal division comprises the following departments :

(a) *Syphilis and sore section*.

- i. A ward for undiagnosed sores.
- ii. A ward for diagnosed syphilis cases.
- iii. A ward for diagnosed soft sore cases.

(b) *Gonorrhœa section*.—In large hospitals where the average number of cases is always such as to call for the use of three or more wards, the best arrangement of accommodation is as follows :

- i. A ward for undiagnosed cases and for cases of simple urethritis.
- ii. A ward for acute cases of gonorrhœa.
- iii. A ward for sub-acute cases and such complications as epididymitis, prostatitis, etc.
- iv. A ward for convalescent cases.

9. The following additional accommodation is required, separate rooms being used where available :

(a) *Syphilis theatre*, with preparation and waiting rooms.

A small room or lobby may be utilized as the preparation room ; here the patients have their urine examined and weights taken before receiving treatment.

(b) *Gonorrhœa theatre*.—This may also be used for the daily inspections of gonorrhœa cases, a section being reserved for instrumentation, prostatic massage, etc.

(c) *Lavage room*.—This must be kept for lavage purposes only. It is very important that the orderly in charge should be a trained special treatment orderly, to ensure that each patient receives treatment as ordered and that they are well instructed in the method of carrying out their irrigations.

The orderly should keep A.F. I 1245 (lavage room nominal roll) entered up to date daily.

(d) *Offices*.—Two offices are required :

- i. For the officer in charge of the division.
- ii. For the use of the divisional clerk and the ward-master. Should accommodation permit, a separate office for the wardmaster is desirable.

10. Immediately a case has been diagnosed, the orderly is responsible for notifying the central hospital office. The number in the admission and discharge book must be entered on the patient's diet sheet, in the space provided for the purpose ; this serves as a guide to the medical officer that the diagnosis has been registered. In cases where a change of diagnosis has been made or a new disease supervenes, the clerk immediately notifies the central office in writing on a special slip known as a " diagnosis slip," showing the particulars of the new disease, date of onset, etc. The particulars must be signed by the responsible medical officer.

11. For every patient admitted to hospital with venereal disease, a venereal case card (A.F. I 1247) is prepared by the orderly clerk. Care must be taken that all entries are made under proper headings. This document consists of eight pages and special headings have been made to meet all ordinary requirements. Entries must be dated and completed whenever the case has been seen by the medical officer. This card is a complete record of the patient's disease during his stay in hospital. When a card is no longer required on account of the termination of treatment or discharge of the patient from the Army, it is sent to the War Office ; should it be needed for any purpose, it can always be obtained on application. Whenever a patient requiring further treatment is transferred from one station to another, A.F. I 1247 is forwarded to the O.C. the nearest military hospital to enable the man to continue his treatment without delay. A duplicate A.F. I 1247 is made out in each hospital in which the patient receives treatment, and is filed as a permanent record of the case.

12. The orderlies in charge of gonorrhœa and syphilis theatres are responsible for the general management of the theatres. Patients in hospital must be given to understand, clearly, the hours at which they will attend the theatre for any purpose. A record must be kept of all patients attending as out-patients. In the case of syphilis patients, a careful record of all drugs given to individuals must be kept in a special attendance book : in this book other important details such as weight, result of urine examination, etc., are also entered.

The orderly in charge is also responsible that a surveillance report (A.F. I 1239) is prepared for the attendance of all

out-patients. This form should be sent off in time to give Os.C. units at least four clear days' notice. The form is also used in cases of patients transferred to other stations. Full particulars should be entered in the appropriate spaces on the form and a copy sent to the medical officer in charge of the unit and the O.C. the nearest military hospital.

13. Medical history sheets (A.F. B 178) are always kept at the garrison medical inspection room or, where there is no inspection room, in the nearest military hospital. As soon as a man has been admitted to hospital, the medical history sheet will be forwarded to the O.C. hospital; if it is not forthcoming, it should be applied for.

In rare cases where the medical history sheet of a man is not available, a new A.F. B 178 will be prepared on the patient's discharge from hospital and will have "Temporary" marked at the top of the front page in red ink. When a patient is diagnosed syphilis, the following entry will be written across the inner pages of the sheet: "Placed under treatment for syphilis at on" This entry will be in red ink. When a patient has completed his treatment, the following entry, also in red ink, will be inserted: "Struck off attendance for treatment and observation for syphilis at on"

When a patient is due for discharge from hospital, the following entries will be made in his medical history sheet: Station and hospital, dates of admission and discharge, total number of days in hospital, including both days of admission and discharge, diagnosis, remarks and signature of the medical officer in charge of the case.

14. A hospital diet and extras sheet (A.F. I 1202) is prepared by the N.C.O. in charge the reception room after the patient has been seen and admitted by the orderly medical officer. All the patient's regimental particulars are then entered, but the columns for diagnosis, diet, etc., are left blank to be filled in later by the medical officer in charge of the case. The form is balanced at the end of every month and a new one made out.

15. Hospital case cards (A.F. I 1220) are prepared in the main hospital office and sent to the clerk in the venereal division. The hospital office is responsible that entries of the patient's particulars are correct, but the medical officer is responsible for the correctness of the diagnosis, which must be printed in block capital letters, and all clinical notes. The clerk in the venereal division must see that the dates of admission and discharge and the total number of days in hospital are correct.

16. Transfer slips to other hospitals (A.B. 172) must be prepared for all cases transferred and must be sent with other documents with the patient. This form should be a brief summary of the entries in the admission and discharge book (*see below*) and brief notes of the case for the guidance of the authorities at the new hospital.

17. The original admission and discharge book (A.B. 27) is kept by the central hospital office, but it is necessary to keep an accurate copy in the venereal division office for the purpose of obtaining figures and other particulars for reports and returns.

18. Patients due for discharge from hospital will be seen by the officer in charge of the division or hospital (whichever applies) before the documents are finally disposed of. All documents, with the exception of A.F. I 1247, are then passed to the central hospital office, where arrangements are made for the notification of the unit concerned and for final disposal of the documents.

Patients are, as a rule, discharged 24 hours after being marked out; in the case of patients of the Royal Air Force, however, 48 hours' notice is required.

19. Daily states showing the number of wards, beds equipped, occupied and vacant, and the number of admissions and discharges (up to 8.30 a.m. daily) will be prepared—in duplicate—and rendered by 9 a.m. daily. One copy will be handed to the chief ward master and one to the hospital office. To avoid mistakes, the clerk should visit the wards and carry out a personal check.

20. In the case of the Royal Air Force, different documents are used. Instead of being army forms they are simply "forms" followed by a number. The form which acts both as medical history sheet and hospital case card is Form 39. It is issued in duplicate, one copy being card and the other flimsy. The flimsy is kept with the medical records of each man in an envelope known as Form 48. A new Form 39 is prepared for each admission to hospital.

21. It must be thoroughly understood that, although not so headed, all documents in use for venereal patients must, at all times, be treated as strictly confidential.

22. In the event of a soldier who is still under treatment for venereal disease being discharged from the Army, Ministry of Health Form V 15 should be filled up. A précis of his venereal history and treatment given should be inserted. This card should be given to the soldier and he should be instructed to go with it to any civilian clinic after leaving the

Army—a list of such clinics should be in the office of every venereal division. (*See also* Regulations for the Medical Services of the Army, 1932, para. 179.)

For instruction for recording cases of venereal disease *see* Regulations for the Medical Services of the Army, 1932, Appendix 12.

For duties of special treatment orderlies *see* paras. 265–275 and for general arrangements, syllabus of training, etc., paras. 577–589 of Standing Orders, Royal Army Medical Corps, 1930.

CHAPTER II

ANATOMY AND PHYSIOLOGY OF THE GENITO-URINARY TRACT IN THE MALE

23. Anatomy.—The urinary tract begins at the kidneys and ends at the urinary meatus (the opening at the end of the penis). The genital tract begins at the testicles and ends at the meatus.

24. The urinary tract. (See R.A.M.C. Training, 1935, paras. 562–569 and diagrams.)

The kidneys.—These organs, two in number, are situated against the posterior wall of the abdomen on each side of the vertebral column; they average 4 in. long, $2\frac{1}{2}$ in. broad and $1\frac{1}{2}$ in. thick; their average weight is 4 to $4\frac{1}{2}$ oz. and their shape is characteristic.

The body of the kidney is made up of large numbers of tiny curved tubules commencing with cup-shaped ends called glomeruli. The tubules and glomeruli are surrounded by a tangle of blood capillaries. All the tubules open into a bag called the hilum (or pelvis) which is situated on the inner side of each kidney. The hilum tapers rapidly to become a tube.

The ureters.—These are two tubes the size of goose quills which begin where the hilum of the kidney ends and run down on each side of the vertebral column; they vary in length from 10 to 12 in. and open in an oblique manner into the base of the bladder.

The bladder.—This is a hollow organ with strong muscular walls and lies in the pelvis. The ureters open into it at the back below, just before it narrows down to the opening of the urethra.

The urethra.—This is a tube which extends from the bladder to the meatus. It varies in total length from 7 to 9 in. The first $1\frac{1}{2}$ to 2 in. is called the posterior urethra, which again is divided into two portions, the prostatic urethra, which is about $1\frac{1}{4}$ in. long, where it passes through the prostate gland, and the membranous urethra, about $\frac{3}{4}$ in. long, where it is surrounded by a powerful muscle called the compressor urethra or “shut off” muscle and lies between the two layers of the triangular ligament.

After passing through the anterior layer of the triangular ligament, the urethra becomes the anterior urethra, which is 6 to 7 in. long and is in turn divided into two parts—a dilated part called the penile urethra, which passes through the penis and ends at the meatus, the last portion being called the fossa navicularis.

The tube of the urethra is not of uniform bore but is widest and most dilatable in the prostatic portion, narrows in the membranous portion, dilates again in the bulb, narrows again in the penile part, dilates antro-posteriorly and is flattened from side to side in the fossa navicularis and finally narrows at the meatus, which is the narrowest and least dilatable portion.

The urethra, as a whole, takes a course from the bladder which may be compared with the letter “S,” the upper curve of the “S” being short and corresponding with the posterior urethra, the horizontal portion, also short, corresponding with the bulb, the lower limb, considerably longer, with the penile urethra. Owing to the course of the urethra, a sort of well or sump is formed at the bulb between the peno-scrotal angle and the anterior layer of the triangular ligament.

25. The genital tract.—*The testicles* are two in number and lie side by side in a muscular bag called the scrotum, which hangs just behind the penis. The scrotum is divided into two compartments by a central partition. Each testicle is surrounded by a tough fibrous coat, the tunica albuginea, and its substance is split into compartments by fibrous tissue raphe; in these compartments are a large number of coiled hair-like tubes, two or more in each. These tubes eventually join together and run into the vasa efferentia of the epididymis.

The epididymes are curved structures situated at the back of each testicle. The upper end of each is enlarged and is called the globus major or head, and the lower end the globus minor or tail: the part between these is the body.

The epididymis is attached to the testicle by loose fibrous tissue. Some fifteen to twenty fine tubes, called the vasa efferentia, come from the upper part of the testicle, with the tubules of which they are continuous; they pass into the globus major of the epididymis, where they become a coiled mass, ultimately becoming a single canal. The body of the epididymis and the globus minor are formed by the coiling of this canal.

The vasa deferentia.—These start on either side at the lower end of the epididymis. Each vas is a thick-walled tube and

is continuous with the canal of the epididymis of the corresponding side and runs up the posterior border of the testicle, inside the scrotum ; it is joined by the blood vessels, lymphatics and nerves which supply the testicle and epididymis and these all together form the spermatic cords, which run up on each side of the penis, over the pubis and through holes in the abdominal wall known as the inguinal canals. After entering the abdominal cavity, the vasa efferentia pass downwards into the pelvis on each side of the bladder until they reach its lower end, at the back ; here they run into the lower end of the seminal vesicles.

The seminal vesicles.—These are two in number and consist of convoluted sacks. They lie against the back of the bladder and diverge upwards like the limbs of the letter “V,” the point of which is situated on top of the prostate gland.

The common ejaculatory ducts.—The openings of the seminal vesicles are below, where they are joined by the vasa efferentia ; from this junction, on each side, a duct runs downwards into the prostate ; these are the common ejaculatory ducts. They run through the prostate gland and open into a small depression in the back of the prostatic urethra called the sinus pocularis : this, in turn, is situated in the centre of a raised, spindle-shaped structure consisting of erectile and muscular tissue called the verummontanum.

The prostate is a body made up of gland and muscle tissue which surrounds the neck of the bladder and that part of the posterior urethra immediately in front of the bladder. It is somewhat of the shape of a chestnut and is pierced by the common ejaculatory ducts. The prostatic ducts open into the sides of the verummontanum and a certain number into a fan-shaped space behind it.

The urethra has many glands opening into it. The *follicles of Littre* are the most numerous—several hundred in number—and are not normally visible to the naked eye. They open chiefly into the roof and sides of the urethra, especially in the penile portion. The *crypts of morgani* are little pockets in the mucous membrane numbering twenty to forty and are also common in the roof of the canal. A very large and consistent one is found in the fossa navicularis and is called the lacuna of morgani or *sinus of Guerin*.

Cowper's glands, two in number, are about the size of a small cherry stone and are found lying under the membranous urethra ; their ducts pass through the anterior layer of the triangular ligament and open into the floor of the bulbous urethra an inch in front of the compressor urethræ muscle.

The openings of all ducts point towards the meatus.

Although not opening into the urethra, two glands are of

great importance ; they are *Tyson's glands* and are situated on each side of the fossa navicularis. Their ducts open below the glans penis on each side of the frœnum of the prepuce.

Surrounding the penile urethra is a structure known as the *corpus spongiosum*. This body enlarges round the fossa navicularis and goes to form the glans penis or "knob." Running along the dorsum of the penis are two structures called the *corpora cavernosa*. The corpus spongiosum and the corpora cavernosa consist of erectile tissue, *i.e.* in structure they are very like a rubber sponge and, when engorged with blood, cause the penis to swell and become erect and hard.

26. Physiology.—The urogenital tract serves two purposes :

- (a) elimination of waste products from the body and
- (b) reproduction of the species.

The small tubules of the kidneys, with their glomeruli, remove water and waste products from the blood. This solution of substances, which, if not eliminated from the blood, would poison the body, passes down the ureters to the bladder, which retains it as urine. When the bladder is full the compressor urethræ muscle is relaxed voluntarily and the urine is passed out of the body through the urethra.

In gonorrhœa, swelling due to inflammation of the urethral mucous membrane or to abscess formation in the prostate, Cowper's glands, etc., may obstruct the flow of urine and cause retention. The contraction of scars due to old gonorrhœal ulceration of the urethra may also obstruct the flow. These scars are known as *strictures*.

The testicles produce millions of small mobile cells called spermatozoa ; these are rather like tadpoles and move through fluid by swimming motions with their tails. They are the germs which are intended to fertilise the female ovum.

Spermatozoa pass through the vasa efferentia to the canal of the epididymis and thence to the vasa deferentia, along which they are propelled by waves of muscular contraction and are eventually stored in the seminal vesicles.

The seminal vesicles and prostate secrete a fluid which forms the bulk of the fluid portion of the semen. Cowper's glands, Littre's follicles, Tyson's glands, etc., produce an alkaline mucoid fluid which lubricates the urethra and neutralizes acid urine, thus rendering it ready to receive the spermatozoa, which only remain active and alive in an alkaline medium.

The verumontanum is formed of erectile tissue and, when erect, blocks the urethra and thus prevents the semen from going back into the bladder during ejaculation.

The structure and physiology of the genital tract are of great importance in the course and treatment of gonorrhœa. Inflammation of the testicle and epididymis cause destruction of the tubules and thus result in sterility. Inflammation of the posterior urethra may cause waves of muscular contraction to pass backwards from the common ejaculatory ducts, through the vas, to the epididymis and may result in the direct spread of the infection backwards. For this reason, sedatives such as belladonna and hyoscyamus are given.

Inflammation and abscess formation in the prostate, follicles and other glands may result in the gonococci being protected from methods used for their destruction and result in chronicity of the disease. For this reason, the prostate is massaged as part of the treatment in order to squeeze the gonococcal pus out of its tubules, etc. Similarly, the urethra is massaged over a metal sound to burst the small abscesses resulting from infection of Littre's follicles.

CHAPTER III

GONORRHŒA

27. Ætiology.—Gonorrhœa in the male is a specific urethritis caused by infection with Neisser's gonococcus and is almost invariably the result of sexual intercourse. Cases have been recorded of infection from infected towels, hands, baths and instruments but authentic cases are extremely rare.

28. Pathology.—The causative organism, the gonococcus, was discovered in 1879 by Neisser. It is a Gram negative, kidney shaped, intra-cellular diplococcus (*i.e.* it stains red with Gram's stain, appears in pairs and is usually found in large numbers inside pus cells). The organism very soon dies outside the body and is easily destroyed by heat and cold, drying and the action of chemicals. The gonococcus is not easily grown on artificial media and requires special conditions for growth; when cultured, it tends to lose its kidney shape and its usual arrangement in pairs. The poison formed by the organism is contained in it and is not released until the coccus has been destroyed; it is therefore called an endotoxin.

It was formerly held that the epithelium lining the fossa navicularis was highly resistant to the invasion of the gonococcus and that to produce a gonococcal urethritis it was necessary for the organism to be carried along from the fossa to the columnar epithelium of the urethra proper. Recent work, however, appears to show that in any infection of the urethra, whether meatal or urethral proper, there is an immediate (well marked within seven hours) dissemination of the invading organisms through the lymphatics as well as a slower surface spread which is associated with the inflammatory reactions described below.

In many cases the tissues are able to deal with the immediate lymphatic invasion, provided that this invasion is not reinforced too freely by fresh supplies from the surface. These facts are of great importance in considering the preventive treatment and abortive treatment methods.

Once inside the fossa navicularis, however, the gonococcus proceeds to multiply and spread backwards towards the columnar cells by multiplication, helped, perhaps, by urethral currents. Having reached the columnar epithelium, the gonococci continue to grow, produce toxins and spread over

the surface, following the epithelium down the ducts of all the glands opening on the mucous membrane. The irritation from the toxins produces a hyperæmia in the vessels of the sub-epithelial connective tissue, which in turn produces a serous exudation from the vessels. This exudate, passing towards the lumen of the urethra, causes loosening, swelling and separation from one another of the epithelial cells and the gonococci then grow down between the cells to the connective tissue.

Epithelial cells are cast off in such large numbers and to such an extent that bare, eroded patches of connective tissue may be left. In this stage the urethral discharge is serous and consists mainly of epithelial cells. If the infection is allowed to proceed, there is now a cellular exudate from the congested blood vessels, consisting mostly of polymorphonuclears, a few mononuclears and perhaps a few red cells. The connective tissue and the longitudinal and circular muscle fibres underlying the epithelium become infiltrated. Wherever the gonococci penetrate, this infiltration is intense and the abundance of infiltrating cells varies in proportion to the number of organisms. It is most marked in the superficial layers and about the mouths of the ducts and glands opening on the mucous membrane so that these become blocked and the cavities filled with inflammatory exudate. There is practically no phagocytosis in the underlying tissue, the gonococci being all extra-cellular, the only active phagocytosis taking place in the lumen of the urethra.

The urethral discharge at this stage is thick and creamy, going on to yellow or greenish and purulent, and may be blood stained; it consists mainly of pus cells with intra- and extra-cellular gonococci and only a few epithelial cells. When the attack goes on to recovery, the intensity of the inflammation gradually subsides in the course of weeks and the eroded patches become covered with a flattened variety of epithelium, often heaped up layer on layer. The gonococci and cellular infiltration in the connective tissue are gradually removed, and finally, the new flattened epithelium is replaced, in part at any rate, by the original columnar variety. In the resolving stages, the urethral discharge changes from purulent to muco-purulent, mucoid, and finally, to a thin, watery gleet which in turn disappears. Towards the end, the pus cells and gonococci become fewer, while the epithelial cells become more frequent for a time, until all disappear from smears and urine.

In a large number of cases, at all stages of the disease, secondary infection with other organisms, in addition to the gonococcus, is common.

The most usual organisms found are various types of the following groups :—

- (a) Diphtheroids, numerous varieties, including cocco-bacilli of an ill-defined type.
- (b) Streptococci, usually of the enterococcus type ; pyogenes being rarely found.
- (c) Staphylococci, mostly of the albus type.
- (d) *B. coli* occasionally.

These secondary organisms have, in themselves, a low pathogenicity, and can flourish in the urethra in more or less pure culture, or in symbiosis.

There are undoubtedly other organisms associated with the disease of an unusual deomorphic type, which are still under investigation.

Of the above types, the most important as regards joint complications would certainly appear to be the streptococcal group, as evidenced by the satisfactory response of such cases to appropriate vaccine treatment.

The importance of these secondary organisms as a complication of gonorrhœa cannot be overestimated, and are the most fruitful cause of chronicity.

Secondary organisms may be discovered on admission, their presence being usually due to infection at the time of sexual intercourse or as a result of unskilled attempts at abortive treatment by the patient or his unqualified friends. It is, however, commoner to find these organisms appearing at a later stage in the disease, in which case they may be introduced by faulty technique—improper sterilization of nozzles, irrigating cans, tubing, etc., or neglect of the patient to clean the meatus. In many cases, however, it would appear that the detection of the secondary organisms at a later stage is due to the lighting up of an original secondary infection previously masked by the acute gonococcal invasion, because the types of secondary organisms definitely proved to be due to faulty technique by isolation are of a different character to those associated with gonorrhœa.

Many cases of chronic prostatitis, arthritis, etc., are directly due to the persistence of secondary organisms after the gonococcus has disappeared from the lesion.

In the process of healing, two factors are concerned—a new deposition of resistant, flattened epithelium and the production of antibodies. The former prevents the recruitment to the tissues of further gonococci from the surface mucous membrane. An antigen from those gonococci which are already imbedded in the tissues is diverted into the blood stream and stimulates the production of antibodies and so brings about the destruction of the organisms.

In untreated cases, the duration of the attack varies with the natural resistance of the patient ; it may be any time from fourteen days to years. In treated cases it may be from ten days to several months.

Recent researches tend to show that marked alkalinity of the body fluids, as evidenced by the *pH* value of the urine (*i.e.* when in the neighbourhood of 7·8 to 8·0), results in a swelling of the gonococcus to almost giant size and causes lysis of the organism, thus releasing large quantities of endotoxin. The effect of this endotoxin on the patient is to produce toxic symptoms and lower resistance, thus increasing the severity of the attack. Acidity (*i.e.* urine *pH* 6·0 to 6·4) causes the gonococcus to become inert and encysted in a mucoid capsule. This capsule is very resistant and is not soluble in anything but strong mineral acids. The effect on the patient is to render the disease very chronic and resistant to treatment ; such cases may be apparently cured but relapse at any time that the body fluids become alkaline. When the urinary *pH* is nearly neutral (*i.e.* 7·2), the gonococcus is in its most active and vulnerable form ; it is highly infective and multiplies rapidly, but it is easily destroyed either by natural or acquired bodily immunity or by chemicals, etc., directed against it.

Unfortunately whilst this alkalinity may be unfavourable to the gonococcus, it seems probable from recent observation that such *pH* value is distinctly favourable to the development and persistence of the secondary organisms above mentioned.

29. Symptoms.—The incubation period between the exposure to infection and the first onset of symptoms varies and is dependent on the number of organisms introduced at the time of infection, their degree of virulence and the natural resistance of the patient. It may be said to lie between three and twenty-one days—the average being between four and seven days.

After the above-mentioned incubation period the patient experiences an itching sensation about the meatus and there may be a slight stinging or burning on making water. The lips of the meatus may be found to have become glued together by a sticky mucoid discharge. Within twenty-four hours of noting these signs there is usually observed a discharge of yellowish-green pus from the meatus, the lips of which are reddened, swollen and pouting. There may be a smarting pain at the end of the penis on passing water. At this stage, the disease is confined to the first inch or two of the urethra, but it rapidly spreads backwards towards the compressor urethræ muscle. So far it is an anterior urethritis only, as

the constriction of the muscle forms a barrier which retards, and sometimes prevents, the backward spread of the disease ; in a large number of cases—Harrison states over 80 per cent.—however, the spread is beyond the compressor and posterior urethritis is established, although there may be no increase in the severity of the symptoms : this opens up the road to many complications of the disease, as will be discussed later.

General symptoms, such as a rise of temperature and its usual accompaniments, headache, constipation, furred tongue, loss of appetite and the feeling of being out of sorts, are not unusual in uncomplicated attacks of gonorrhœa. The mental attitude of the patient is also, as a rule, characteristic and is a mixture of depression and inferiority complex ; this is, no doubt, partly due to the nature of the disease, but also, and this also applies to other general symptoms, to the effect of large doses of gonococcal endotoxin.

The disease has a natural tendency to spread along the genito-urinary tract, giving rise to one or more of the various local complications which are described below. In addition, in many cases there is a spread *via* the blood stream, resulting in general or metastatic complications ; the frequency with which these latter complications occur tends to show that a gonorrhœal septicæmia is not so uncommon or so dangerous as is generally supposed.

30. The complications of anterior urethritis are :—

(a) *Retention of urine* from local swelling or spasm.

(b) *Chordee*.—There is usually pain on erection, and occasionally, along with marked tendency to erection, an inflammatory exudation around the urethra, which interferes with the elasticity of the corpus spongiosum and results in incomplete erection, the erecting corpora cavernosa dragging on the tender urethra and corpus spongiosum, thereby causing the most acute pain. The condition may also be due to extension of the inflammatory process to the blood sinuses of the corpora cavernosa and spongiosum, causing adhesion and preventing the normal erection of the parts.

(c) *Balanitis or balano-posthitis*.—This condition is inflammation of the foreskin and glans penis and is not necessarily venereal. It is due to lack of cleanliness and retention of irritating discharges behind a tight prepuce. The glans and the lining of the preputial sac are red, inflamed and much thickened. A thick, yellow discharge, with characteristic sickly smell, exudes from the opening of the foreskin. It may be accompanied by so much œdema that the orifice is contracted and practically blocked (phimosis), or else, after

it has been drawn back with difficulty or slipped back on erection, forms a tight constriction behind the corona (paraphimosis).

(d) *Lymphangitis and lymphadenitis*.—There may be severe œdema, even amounting to solid œdema, of the integument of the penis and the lymph glands of the groin may be enlarged and even suppurate.

(e) *Folliculitis*.—This is really an invariable accompaniment of anterior urethritis and is only looked on as a complication when, although the general inflammation of the urethra subsides, foci of the disease remain in greater or lesser numbers of the glands. The follicles can be felt when inflamed.

(f) *Cowperitis* is an inflammation of one or both Cowper's glands. It causes a good deal of pain in the front of the rectum, aggravated at the end of micturition when the gland is squeezed by the compressor urethræ muscle. The inflamed and enlarged glands can be felt between the finger and thumb if the former is placed just inside the rectum. An abscess may form which usually points into the perineum.

(g) *Periurethral abscess*.—If the reaction in the corpus spongiosum is severe, a local abscess may form or one of the infected follicles may go on to abscess formation. The resultant abscess burrows into the surrounding tissues and may point either through the skin of the penis or into the urethra.

(h) *Fibrous stricture* may be formed by the contraction of thickened mucous membrane or sub-mucous tissue.

(i) *Urethral fistula*.—This may result from the bursting of a periurethral abscess through the skin.

(j) *Tysonitis*.—Inflammation of one or both Tyson's glands may occur, with or without abscess formation. These can be seen and felt as red swellings on each side of the frænum of the prepuce. On squeezing the swelling, a bead of pus can usually be expressed from the orifice of the duct.

31. Posterior urethritis.—The spread of infection to the posterior urethra is usually heralded by a definite set of symptoms. The usual sequence of events is :—

(i) The purulent urethral discharge very markedly diminishes or dries up altogether.

(ii) The patient finds that he is having to pass water very frequently ; this may not alarm him during the day, but when he finds that he has to get out of bed two or three times during the night, he will complain about it.

(iii) There is pain just at the end of micturition.

(iv) Having passed water, he is not satisfied ; he still feels as though there was more to be passed—this symptom is known as “stranguary.”

(v) A few drops of blood may be passed at the end of micturition.

(vi) There may be sudden onset of acute retention of urine.

32. The complications of posterior urethritis are :—

(a) *Prostatitis*.—This condition results from the direct spread of infection from the posterior urethra along the prostatic ducts and results in inflammation of the gland substance with or without suppuration. In the acute stage the symptoms are the same as those of severe posterior urethritis, with the addition that there is usually a sensation of pain in the rectum.

Acute prostatitis.

Pathology.—The gonococci having spread along the ducts from the posterior urethra, produce the usual inflammatory reaction. There is intense congestion of the mucous membrane, which readily bleeds, and the epithelial cells are loosened and cast off. The secreting cells swell up and cease producing their lecithin emulsion, there is a serous and leucocytic exudation and a cellular infiltration of the sub-epithelial tissues. A sero-purulent discharge is produced which fills up the tubules and is poured out into the urethra. The inflammation usually begins to subside within ten days, going on in some cases to complete resolution but in others to a chronic congestion. In some cases the inflammation increases in intensity, going on to abscess formation on blocking of the ducts.

Symptoms.—These are the same as in posterior urethritis with the addition that there is increased discomfort or actual pain on defæcation and micturition. There is a feeling of a foreign body in the rectum, with perhaps actual pain. In addition there is suprapubic pain or pain referred to the point of the penis. The temperature may go up to 103° F.

Chronic prostatitis.

Pathology.—This may follow the acute form or have been more or less chronic from the start. It is an extremely common complication of gonorrhœa and may last for years, forming a focus for recurring infections both for the patient and his partner in intercourse. It very often continues as a result of a secondary infection long after the gonococcus has disappeared from smears. It is the commonest focus of

infection in the case of rheumatism and chronic arthritis (*see below*).

Symptoms.—These may be entirely absent or there may be a feeling that the bladder has not been completely emptied or there may be delay or inefficient expulsion of the last few drops of urine ; some functional disturbance of sexual powers, *e.g.* impotence with increased desire, spontaneous discharge of prostatic or spermatic fluid during defæcation, or spasmodic leakage of prostatic fluid due to loss of muscular tone. Neurasthenic symptoms are frequent in long-standing cases and are aggravated by defective internal secretion of the gland or its complex nervous system. The commonest symptoms are :—Slight frequency of micturition, especially at night, and some suprapubic discomfort ; a sudden imperative call to micturition, a feeling that the bladder has never been completely emptied ; phosphaturia, mistaken by the patient for spermatorrhœa, so adding to his depression ; a feeling of alternate heat and cold accompanied by “ clammy sweating,” and generally felt in the back, limbs or urethra ; tinglings, rheumatic pains and neuritis. There is general ill-health, with perhaps sexual neurasthenia and mental depression.

Painful nocturnal seminal emissions are not uncommon. Metastatic complications of gonorrhœa usually follow chronic prostatitis.

Prostatic abscess.

Pathology.—Should any of the ducts become blocked during the acute stage, an abscess is formed, the exact extent of which is limited only by the acuteness of the local condition.

Symptoms.—Usually a sharp rise of temperature is noted, 103° to 104° F. ; pain and difficulty in passing water going on in most cases to complete retention ; pain during defæcation and pain in the perineum.

(b) *Vesiculitis*.—Infection is due to direct extension along the ejaculatory and seminal ducts from the prostatic urethra ; hence the invariable association of vesiculitis and prostatitis. Predisposing causes are sexual excitement, sexual connection during an attack of gonorrhœa, physical strain, too early or injudicious instrumentation and alcohol.

Pathology.—This complication is much more common than is generally stated and is very intractable to cure. It may arise any time after the posterior urethra has become infected, and, when present, is always in conjunction with prostatitis. Owing to the vascularity of the vesicular walls, there is every chance of the gonococci gaining an entrance to the blood

stream, and in fact, it is commonly held that all systemic (metastatic) complications of gonorrhœa originate in a vesicular focus. The vesicles, therefore, should always be examined in cases of systemic infection, and in fact, in every case of chronic gonorrhœa.

There is usually an accompanying perivesiculitis and inflammation of the vas deferens, so that there is very great danger of stenosis and blockage of the latter. When this does occur, the seminal emissions, which are a common symptom of vesiculitis, are painful. One or both vesicles may be affected and the condition may be acute or chronic.

Symptoms.—As a rule the discharge, if any, is slight and amounts to a “bonjour” drop or a little meatal moisture.

There may be vague pains in the perineum, lower abdomen or loins, more marked during defæcation and referred along the urethra to the glans or to the testicles. Cases of vesicular colic have been described in which the pain was as acute as in the renal or hepatic forms. Painful erections and emissions are common, and the latter may be blood-stained.

There may be premature ejaculation, impotency and sterility. Frequency, urgency of and painful micturition are common, while there is usually phosphaturia.

With blockage of the ejaculatory duct, a condition of what practically amounts to abscess formation takes place and this has been known to burst into the peritoneal cavity; as a rule, however, it bursts into the urethra or bladder.

With inflammation of the vas there is abdominal pain which may be so severe as to cause nausea, vomiting, etc., and which, in fact, has been mistaken for acute appendicitis.

(c) *Vasitis.*—This is the next step in the spread of the disease along the genital tract and is likely to accompany or follow a vesiculitis. The inflammation spreads along the vas deferens towards the testicle.

The patient complains of pain in the lower part of the abdomen (on the affected side) and the groin, running down the spermatic cord to the testicle. If the spermatic cord is felt, it will be found to be thickened as compared with the sound side and will be tender to the touch.

(d) *Epididymitis.*—This is one of the commonest complications of gonorrhœa and infection is due either to direct extension from the prostatic urethra *via* the ejaculatory duct and vas deferens or through the blood stream or lymphatics, the former being the course in most cases.

Ætiology.—Predisposing causes are local trauma, irritation or injury due to excessive or too early treatment or

instrumentation, too early or too vigorous prostatic or vesicular massage, lavage under too great pressure, sexual excitement or excess and too energetic exercise or heavy work during the acute stage of gonorrhœa. Delay in emptying a full bladder during an attack of acute gonorrhœa has also been given as a predisposing cause.

About 16 per cent. in all cases of gonorrhœa and about 5 to 6 per cent. in treated cases develop this complication. Both sides are affected with practically equal frequency. The most usual times of infection are in the second, third or fourth weeks of an acute gonorrhœa.

Symptoms.—The attack may be acute, subacute or chronic. In the acute stage, there may be some tenderness of the cord at the external inguinal ring and a rise of temperature some hours before the appearance of any scrotal swelling; while, for some thirty-six or forty-eight hours before, the urine may become persistently thick and milky with a large deposit of phosphates. There is some frequency and urgency of micturition.

These symptoms are followed by a burning sensation over the globus major with swelling and considerable pain for the first few days, the swelling being exquisitely tender. The scrotum may be red and œdematous and fluid may accumulate in the tunica vaginalis, resulting in an acute hydrocele.

This stage may go on to pus formation; lymphangitis and dragging on the cord cause pain along the cord, extending into the inguinal canal. The temperature may go up as high as 103°–104° F. The inflammation reaches its maximum in from three to five days and remains in a more or less stationary condition for another three to four days; then begins a slow resolution. In subacute cases, the symptoms are less severe and each stage is shortened by a day or two, whilst convalescence is usually more rapid and complete.

33. Metastatic Infections.—The infection by the gonococcus is always at first a local condition and it usually remains so, though general disturbances may arise in various ways. Thus the gonococcus and other secondary infecting organisms may remain localized near the original site of infection, while their products are absorbed in sufficient quantities to create general disturbance in the acute stage, or to exert a toxic action on susceptible structures in the chronic stage.

Again, the gonococcus, and sometimes any of the pathogenic secondary organisms, may reach the general circulation and flourish there or, more generally, confine their attack to some more susceptible structures.

(a) *Septicæmia and pyæmia*.—These are rare but very serious when they occur. They are usually due to mixed infection, but a virulent infection of pure gonococcal origin is not unknown.

In the acute type, the symptoms are those of any acute septicæmia with a great tendency to endocarditis. The disease may simulate typhoid or malaria, while the spleen is usually large. The liver may be enlarged or atrophied and jaundice is not uncommon. Albuminuria is usual.

Skin eruptions are fairly common and have been classified into four groups:—simple erythema and scarlatiniform, urticaria and erythema nodosum, hæmorrhagic, and lastly, bullous hyperkeratosis.

In chronic cases, the symptoms are less severe: evening temperature, headaches, malaise, etc.

Diagnosis.—Isolation of gonococci from the blood, complement deviation test and history.

Complications.—Arthritis, endocarditis (usually ulcerative type attacking aortic valves), pericarditis, myocarditis, meningitis, peritonitis, pneumonia, pleurisy, iritis, conjunctivitis, thrombosis and embolism.

(b) *Gonorrhœal rheumatism*.—This is the commonest metastatic complication and usually occurs about the third week of an acute attack, *i.e.* after infection of the posterior urethra: cases have been noted as early as the fifth day and as late as the seventh year after infection. Those which occur late are, as a rule, due to secondary infection rather than to the gonococcus. In the acute stage of the disease, the commonest manifestation is an acute arthritis and the joints usually affected are those put to the greatest strain and are, in order of frequency, knee, ankle, wrist, fingers, great toes, elbow, shoulder, hip, tempero-maxillary and sterno-clavicular.

Teno-synovitis, and periarticular tenderness, are common. Symptoms and physical signs are the same as for other types of rheumatism.

Gonococci have been recovered from the serous effusion, but not later than the sixth day after the onset of the arthritis, and from scrapings from the synovial membranes, but are sparsely distributed.

Teno-synovitis and less commonly *bursitis* may occur with or without arthritis. *Myositis*, *fibrositis* and *neuritis* of gonorrhœal origin may occur. In neuritis, the sciatic nerve is most often affected but other nerves may be involved.

Gonorrhœal rheumatism may take a chronic course or may begin as such, in which case it occurs late in the disease and cultures taken from the joints, etc., may be sterile; these

cases are probably due rather to infection with secondary organisms than with the gonococcus.

In *arthritis*, the following varieties of joint disturbances are usually described :—

Arthralgia.—Pain in the joint without inflammation, often associated with myositis and teno-synovitis.

Hydro-artrosis.—An effusion into the joint, usually one or both knees, occurs rapidly. The stress falls on the synovium mainly, but the ligaments are weakened and tend to become stretched. Even the periarticular structures (tendon sheaths, bursæ, etc.) may be inflamed and become somewhat fixed. The condition may last two or three months and is very resistant to treatment.

True *arthritis* is the most common form. The rise in temperature is less than in ordinary rheumatism and sour sweats are not a feature. *Polyarthritis* is a rare form of gonorrhœal arthritis; it resembles the rheumatoid form in attacking the digits but a more limited number of joints are affected.

All forms of gonorrhœal rheumatism run a long and tedious course, but permanent gross damage seldom results. Ankylosis is rare, but contractures from fibrous tissue formation with stiffness and adhesions are common enough where treatment has been injudicious or inadequate.

Gonococcal flat foot.—This well-recognized condition, marked by pain, tenderness and lack of strength in the foot and calf, results from a chronic inflammation in all structures concerned in the maintenance of the arches of the foot, and if they are subjected to ordinary strain of weight bearing develop a marked degree of flat foot. Even the periosteum of the os calcis may be affected, and as in other conditions producing fibrosis, a bony spur may grow from its inner surface along the plantar ligament. "Painful heel" is a common symptom of chronic gonorrhœa.

(c) *Acute endocarditis*.—This, fortunately rare, complication generally occurs during the first few weeks of the disease. It may give rise to no symptoms or may produce fever, palpitations, dyspnœa and precordial pain. Chronic valvular lesions may result, most often on the left side of the heart. If secondary infection, resulting in ulceration, occurs, the outlook is very grave.

(d) *Iritis*.—Invasion of the eyes *via* the blood stream usually follows an attack of gonorrhœal rheumatism and is exclusively confined to males; the main seat of invasion is the iris. The patient complains of pain in the eyeball, headache, a varying degree of photophobia, lacrymation and disturbance

of vision. It is chronic in nature and liable to recurrence. As a rule, one eye only is attacked.

(e) *Keratoderma blennorrhagica*.—This rare complication of gonorrhœa always follows or accompanies gonorrhœal rheumatism; it is a metastatic infection of the skin and is usually seen on the soles of the feet though it may occur on the palms of the hands and, very rarely, on the scalp and face. There is a thickening of the horny layer which has embedded in it a number of yellowish or brownish discrete nodules varying in size from a millet seed to a small coin. These nodules are most profuse on the heels and sides of the feet.

34. Extra-genital infections.—So far, infection of the genital tract and metastatic complications in other parts of the body have been considered. The gonococcus is, however, capable of direct infection of mucous membranes other than that of the genito-urinary tract.

(a) *Proctitis*.—Infection of the rectum is comparatively rare and is much commoner in women than in men. There is pain in the rectum, tenesmus, irritation, reddening and excoriation of the anus, and discharge.

(b) Infection of the mucous membranes of the mouth and nose is known, but it tends to die out in these situations and irrigation with weak permanganate solution will readily effect a cure.

(c) *Gonococcal ophthalmia*.—This is due to direct infection of the conjunctiva by the gonococcus, conveyed as a rule by the patient himself through lack of cleanliness. Accidental infections occur from infected towels, handkerchiefs, bath water, splashings of urine, etc.

The disease occurs in males more often than in females and in the majority of cases remains unilateral if proper precautions are taken to protect the healthy eye. After an incubation period of from one to three days, a painful, burning sensation is felt in the lids which become swollen and red. There is a serous discharge exuding from the closed lids and examination of these reveals the gonococcus.

If the lids are opened, the conjunctiva is seen to be red and œdematous, the ocular portion being so swollen that the cornea seems to be sunk in the middle of it. After three or four days, the exudate becomes purulent and the swollen ocular conjunctiva tends to overlap the cornea. Gradually, in favourable cases with proper treatment, the œdema and discharge diminish and the eye returns to its normal condition in from three to four weeks. A ring ulcer may form round the periphery of the cornea; the whole cornea may slough, or

the centre may become infiltrated, softened and perforated. As in gonococcal infections elsewhere, the ordinary pyogenic bacteria are superadded and the whole destructive process may, in bad cases, affect the whole globe (panophthalmia).

35. Diagnosis and Examination of the Patient.—

The examination of the patient should be carried out in the following order : The penis, its lymphatic vessels and glands, the spermatic cords, the testicles, the urine, Cowper's glands, the prostate gland and the seminal vesicles.

Make sure that the discharge comes actually from the urethra and is not due to balanitis, balanoposthitis, a sore or warts under the prepuce.

Note the nature and amount of the discharge ; whether it is mucopurulent, purulent or blood stained. Is it continuous and seen shortly after passing water ? Is it present during the day or only in the morning ? The latter means a chronic case, the so-called " gleet."

Examine the penile lymphatics and glands at the root of the penis and in the groin. Examine the spermatic cords and scrotal contents for signs of present or past disease. Clean up the meatus, glans, etc., and take a urethral smear on a sterile platinum loop and a clean slide.

In the earliest stage, say the first two or three days after infection, the only method of diagnosing the disease is by urethral smears, there being no symptoms or signs, with the possible exception of some stickiness of the meatal lips. A smear shows mostly epithelial cells, a few pus cells and a few extracellular gonococci, sometimes in small clusters. Unfortunately, few, if any, patients apply for treatment at this stage. When first seen the usual condition is with purulent discharge and some symptoms of acute gonorrhœa—tickling, slight burning and smarting on micturition, redness of the meatus, swelling or œdema of the penis, etc. Smear of the pus stained by Gram's method should show few epithelial cells, pus cells in profusion (200 to 300 to one epithelial cell), and both intra- and extra-cellular gonococci. These signs, in the absence of a history of a previous attack, indicate a fresh infection ; it is extremely difficult or impossible to distinguish between a fresh infection and an auto-reinfection.

With a thin watery or mucoid discharge and a smear showing epithelial and pus cells in the proportion of about one to five or ten and very few gonococci, mostly extracellular, chronic gonorrhœa is indicated. An acute posterior urethritis is relatively uncommon and is diagnosed symptomatically and from urine inspection, the usual symptoms being frequency and pain on micturition, a few drops of blood at the end of micturition, a dull pain referred to the back or perineum

and sometimes malaise. In uncomplicated chronic posterior urethritis, there may be no symptoms whatever.

36. Urine inspection.—The best results are obtained when the urine is that first passed on rising in the morning and when it is allowed to stand for half an hour before inspection. Failing this, the urine should have been retained for four or five hours before passage.

Turbidity of the urine may be due to :—

- (a) Pus—this is the commonest cause in an acid urine.
 - (b) Phosphates—the most usual cause in an alkaline condition of the urine, which may disappear on the addition of acetic acid.
 - (c) Urates—these disappear on heating.
 - (d) Bacteria
 - (e) Semen
- } exclude by microscopic examination.

For the reading of urine tests, renal conditions must have been previously excluded.

Many methods of urine examination have been devised, and two, four and even seven glass tests have been advocated and are still used. For all practical purposes, however, a two glass test is sufficient. The posterior urethra is more or less one with the bladder ; that is to say, a profuse discharge into the posterior urethra will find its way into the bladder in sufficient quantity to render the whole contents cloudy.

The anterior urethra is shut off from the posterior by the compressor urethræ muscle. If the patient micturates into two glasses, the first portion of the flow will wash out the anterior urethra and will therefore afford an indication of its state, especially when compared with the second glass.

The second glass will moreover indicate the condition of the posterior urethra.

Two simple precautions are necessary in this macroscopic test :—

- (a) The glans should be thoroughly cleansed first.
- (b) The glass should be quite clean.

Results :—

(a) Both glasses are turbid—acute anterior and posterior urethritis.

(b) First glass turbid, second clear—acute anterior urethritis.

(c) Both clear but filaments in one or both—a localized chronic lesion (heavy, comma-shaped threads which sink rapidly to the bottom usually indicate prostatitis).

If one or both glasses are cloudy, acetic acid should be added. By this means a cloudiness due to phosphaturia is cleared up.

Filaments or threads may be divided into two varieties :—

(1) Heavy—which quickly fall to the bottom of the glass.

(a) Mucopurulent filaments—of various sizes and shapes. These indicate active inflammation and consist of mucus, pus cells and small areas of epithelial cells detached from the mucous membrane and numerous gonococci. So long as they persist in the urine, treatment must be continued.

(b) Pear or comma-shaped plugs from the prostatic gland sinuses indicate inflammation of that gland, but these are often absent even in cases of prostatitis.

(2) Light—which remain suspended a little time before sinking.

(a) Comma-shaped filaments—from Littre's glands. These can be well demonstrated in cases of littritis (folliculitis) after massage of the anterior urethra over a metal sound. They remain suspended for a time, then gradually fall to the bottom of the glass.

(b) Flat epithelial flakes—usually seen in the later stages of an attack when the damaged epithelium is being restored. They consist almost entirely of epithelial cells with one or two pus cells. They sink a little sooner than the comma filaments from folliculitis.

(c) Fine, threadlike forms—these delicate threads are found only in the terminal stages and consist only of epithelial cells. Sometimes they are in small clusters and persist at times for long periods after the attack has subsided.

37. Further examination in an acute case is not indicated, as the less interference and instrumentation, the better the chance of recovery of the patient. In subacute and chronic cases, however, lurking places of the gonococcus must be located and given special attention.

To test the anterior urethra for such foci of infection a sound may be passed and the urethra massaged over it. In this way inflamed follicles can be felt and emptied by massage. Urethroscopic examination will reveal the condition of the whole canal.

The condition of Cowper's glands, the prostate and the seminal vesicles can be ascertained by prostatic massage; this is carried out as follows :—The patient assumes the knee-elbow position, the examiner stands on the left side and inserts his gloved and lubricated right forefinger into the rectum.

Cowper's glands cannot normally be felt, but if one or both are inflamed, they can be felt between the finger in the rectum and the thumb on the perineum.

Examination of the prostate requires some experience. It should be noted whether it is enlarged on one side or both, whether it is hard or is "boggy" and pits easily on pressure. The patient should be asked whether there is actual pain or merely discomfort. It should be massaged until drops of secretion appear at the meatus; a film should be taken from this secretion and stained. In cases which are clearing up, it is an advantage also to take a fresh specimen from this secretion and to examine it immediately under a cover slip. If living spermatozoa are found, it may be assumed that the prostate and vesicles have practically recovered. Absence of spermatozoa in a clear case of chronic prostatitis and vesiculitis implies that the disease is still active or that the epididymis, vas, etc., are damaged, whilst dead or distorted forms suggest that the condition is improving.

Normal seminal vesicles cannot be felt, but if inflamed, they can be felt as irregular, tender nodules above the prostate.

After prostatic massage, the patient is told to pass his water into two glasses. On examination of these, if threads, etc., are present, the diagnosis is confirmed. A small spot of blood at the bottom of the first glass usually indicates infection of the seminal vesicles.

38. Diagnosis of complications.—*Prostatitis.*—In the acute stage, as little manipulation as possible should be attempted and diagnosis should be made from symptoms. In the chronic stage, prostatic massage will give an indication of the condition of the gland, as is also the case in prostatic abscess, and in vesiculitis and Cowperitis.

The normal prostatic fluid is an opalescent, slightly milky emulsion of a thicker consistency than water. In the diseased state it is of a dirty, greyish colour, looks like a suspension and not an emulsion, is alkaline to litmus and is a mixture of serous exudation and pus. Minute particles, flakes or pear-shaped threads, are seen in the prostatic urine glass. Microscopically, numerous polymorphonuclear cells, some lecithin granules, epithelial cells, sometimes showing two layers, and both intra- and extra-cellular gonococci are present. In some cases there may also be eosinophiles. In chronic prostatitis, the urethral discharge is usually slight, but there may be a persistent cloudiness of both urine glasses and the characteristic pear-shaped filaments may be present. It is possible, however, to have clear urine with chronic prostatitis. Examination shows the prostate enlarged and firm to the

touch, but seldom tender. Sometimes a difference in the size of the two sides is noted and the surface may be smooth or nodular.

Prostatic abscess.—Urethral discharge may lessen or cease, the urine in both glasses is turbid and the second contains comma-shaped threads. Rectal examination reveals a large, tense and exquisitely tender swelling bulging into the rectum. Fluctuation may be elicited.

Vesiculitis.—As the symptoms, when present, are to all intents and purposes the same as those of prostatitis, diagnosis is made by rectal examination, but it must be remembered that in chronic cases there may be no symptoms at all.

The examining finger must be passed over and beyond the upper limits of the prostate and it may be taken as a working rule that, if the vesicle is palpable, it is infected.

In acute cases, it is extremely tender and a hot, fluctuating mass may be felt. The state of the urine depends on the patency or otherwise of the ducts. If these are open, then all glasses may be uniformly turbid, while if they are closed, the urine may be clear with only prostatic filaments in it. An acute case tends to resolve in from two to three weeks, but most cases pass into the chronic stage and as so may persist for months or years. Sterility may result, and various sexual disabilities. The patient should always be warned of the likelihood of a systemic infection taking place.

Epididymitis.—A swelling of the epididymis, and especially when associated with some swelling of the spermatic cord, occurring during an attack of gonorrhœa, is practically always a gonococcal epididymitis.

From Orchitis.—Make out the enlarged globus major, body of the epididymis and globus minor; the sulcus between the epididymis and the testicle can almost invariably be made out on careful examination. The origin of the pain is as a rule in the globus minor, which is also very tender in epididymitis. Where the inflammation goes on to abscess formation, there may be a leucocytosis up to 30,000. In orchitis, the body of the testis itself enlarges, while the epididymis, being stretched over its posterior surface, can, with difficulty, be distinguished. The urine should contain purulent flakes or threads, which should be examined by Gram's method of staining for the presence of gonococci in cases where gonorrhœa is denied and there are no signs of urethral discharge. Make a careful rectal examination to ascertain the condition of both prostate and vesicles, especially the latter on the affected side, as there is practically always infection of the vesicles along with that of the epididymis.

In the progressive stage of epididymitis, the urethral discharge may completely disappear, to reappear on the subsidence of the acute stage.

From tuberculosis.—As a rule this begins in the globus major and is of slow onset, and one finds evidence of tuberculosis elsewhere, *e.g.* nodules in the cord, vesicles, etc.

From bacillus coli infection and the uncommon influenzal infection. Examine the pus from the urine and centrifugalize the urine for the presence of organisms.

39. Abortive treatment.—Ninety per cent. of successes were obtained where treatment began on the very first day, success meaning complete cure in a week or ten days.

When the case is first seen more than twenty-four hours after the onset of the first symptoms, the prospects of success are remote. A short incubation period and a first attack are unfavourable indications. Disappearance of the gonococci on the second or third day of treatment usually means a successful issue.

Abortive treatment must not be carried out once a purulent discharge has appeared or if severe subjective symptoms are present. The ideal time to start this treatment is when the meatus is slightly red and itching and the lips glued together with a thin glycerine-like discharge. Unfortunately, during the past few years, a great change has taken place in the acuteness of gonorrhœa and suitable cases for abortive treatment are not often seen.

The patient should be detained for the first day until the result of the urethral smear has been obtained. Mark "bed" and on a milk diet and keep the bowels well open with salines. Instruct him to drink water or barley water *ad lib.* Prescribe an alkaline mixture.

If gonococci are present in the smear, detain the patient for a further two days and carry out abortive treatment as below.

If no gonococci are present, return the patient to duty but mark to attend twice daily until further notice.

If the patient is detained, take a urethral smear each morning before any treatment has been given.

There are several methods of abortive treatment, differing only slightly in detail; one of the best is the following:—

(i) Make the patient pass his urine.

(ii) Wash the external genitals with a spirit solution of biniodide of mercury, 1/2,000; the meatus, glans, corona and frænum receive special attention.

(iii) The patient is then instructed to grasp and compress the penis at the peno-scrotal angle so as to prevent any fluid passing further back.

(iv) Whilst the penis is still being compressed, irrigate with a pint of hot (106° F.) potassium permanganate solution, 1/6,000, to which has been added one drachm to the pint of sodium bicarbonate solution of 1 per cent. strength.

(v) Release the grip at the peno-scrotal angle and irrigate the whole anterior urethra with another pint of solution as in (iv) ; the douche can to be 3 ft. above the pelvis.

(vi) With a syringe inject into the anterior urethra 5 to 10 c.c. of a solution of a silver salt and get the patient to hold it in for twenty minutes ; see that the meatus gets its share of the solution. The patient may either hold it in by pressure on the glans or it may be sealed in by drying the meatus and applying a layer of collodion soaked gauze. The silver solutions recommended are :—silver nitrate $8\frac{3}{4}$ grs. to the oz., protargol, protosil or argyrol 5 per cent., neoprotosil or lunisol 10 per cent.

(vii) The patient should avoid passing water for two or three hours after.

(viii) Repeat the whole process three times on the first day and morning and evening on the second and third days.

(ix) Take smears on the fourth day.

If the smear on the fourth day still shows gonococci, the abortive treatment has failed. If no gonococci are found, mark the patient out for discharge that day but give two anterior irrigations with a hot solution of pot. permang., 1/8,000, with 1 per cent. sod. carb. Warn the patient as regards the dangers of alcohol and over-exertion and that he must keep his bowels well open. Mark him also to attend twice daily until further notice and give him two anterior irrigations daily on the fifth and sixth days.

If the smear is quite clear on the seventh morning, he need no longer attend but should be instructed to be on the look-out for any signs of infection.

40. Treatment.—*General.* Absolute rest in bed for the first three to six days, according to the severity of the symptoms.

The patient should avoid everything likely to stimulate the sexual senses.

Give calomel on the first evening and salts each morning as required, to ensure a regular and free action of the bowels.

Support the penis on the thigh and give a roomy cotton penile bag with a wool pad, frequently changed. Ensure absolute cleanliness of the parts. If there is any degree of phimosis, syringe out the preputial sac frequently with 1/20,000 pot. permang.

Give an alkaline diuretic mixture every four hours and check the amount required by frequent urine examinations—a constant pH of 7·2 is to be aimed at.

The best alkali to use is alkaline sodium phosphate (hydrogen di-sodium phosphate) in massive doses—as much as 240 grs. four times a day may be required in some cases. If this is not available, sodium bicarbonate in combination with potassium citrate and potassium bicarbonate may be substituted. The alkaline mixture should also contain tr. hyoscyamus, and if there are any symptoms of commencing posterior urethritis, tr. belladonna (*see* Appendix VII).

Diet should at first be milk, but only for a minimum period. Gradual increase is indicated and the patient can be on ordinary diet at the end of a week as a rule. All spices, condiments, etc., should be avoided. Vegetable soup, made from the water in which the vegetables have been boiled, and suitably seasoned with stock, etc., is excellent and helps to supply calcium and other salts which may be deficient as a result of the amounts of sodium phosphate taken. Water and barley water should be given freely—not less than 4 pints daily.

When the patient is “up,” he should be encouraged to take walks round the grounds; exercise should be gradually increased and graduated P.T. for 15 to 20 minutes every morning instituted as early as possible.

Each patient should, however be made to wear a suspensory bandage either in the form of a “jock strap” or cotton “janghra” or of the pattern illustrated and described by Colonel Harrison in his book. These can be easily made by the hospital tailor.

Mental treatment is of first importance. A highly strung, imaginative individual, physically reduced by insufficient diet and exercise, who has it constantly drummed into him that he is a criminal and an outcast and who has been given plenty of time to brood over his sad fate, becomes a chronic and extremely difficult case to cure. Whilst discipline in a venereal ward must necessarily be strict, a cheerful, sympathetic and optimistic attitude on the part of the medical officer and attendants is as much a part of the treatment as irrigations.

The shorter the period in hospital, the better for the patient and the greater saving to the State, both financially and in efficiency. As soon as acute symptoms have subsided and smears ceased regularly to show gonococci, even though the patient still has a gleet, he should be discharged from hospital to barrack treatment. The best way to achieve this is to arrange with the O.C. a unit in the station to form a “special attached section,” to which all such cases, to whatever unit

they may belong, may be sent. When in the attached section, they are under the command of a N.C.O. and carry out all duties and training but are barred from the wet canteen and are not allowed on pass. They are marched to the hospital every day for treatment and are seen by the medical officer once a week, or oftener if required, for special treatment. They do guards and carry out their ordinary training with the exception of heavy work. When they are apparently free from disease, they are discharged from the attached section and return to their own units for full duty but are kept under surveillance for a further three months. Should they, whilst either in the attached section or under surveillance, develop symptoms of complications, they are readmitted to hospital as relapses.

41. Local.—Irrigation should be begun at the earliest possible moment and should always be both anterior and posterior. The irrigation fluid should be warm (106° to 108° F.). Pot. permang. is still the best drug to use and should be in a strength of $1/20,000$. The addition of a drachm to the pint of a 1 per cent. solution of sod. carb. is advantageous. The strength of the solution may be increased as the acute symptoms subside, but it is rarely required stronger than $1/8,000$.

Should secondary infection supervene, pot. permang. should be replaced by mercury oxycyanide, $1/8,000$, or perchloride, $1/20,000$; these should not be continued for more than two days for fear of setting up a chemical urethritis.

The number of irrigations required are two a day in ordinary cases and three in severe. Reduce to one as the condition improves. In order to continue local treatment during the night, some form of soluble bougie may be used with advantage—the proprietary brand known as “Gonostyli” (Biersdorf) containing 1 per cent. albargin in a water soluble base have been found effective for this purpose.

Treatment and progress should be controlled by microscopic examination of the discharge at least twice a week and always after any special treatment. A useful guide to progress is the proportion of epithelial to pus cells per field, say 1 to 200 to 1 to 5 in the first ten days, and a decrease in the number of intracellular gonococci. An unchanged ratio of epithelial to pus cells or a marked increase in the number of organisms indicates a lack of resistance on the part of the patient and invasion of the sub-epithelial tissues and glands and follicles:

42. Lavage.—There are two methods of irrigation; one which flushes out only the anterior urethra, *i.e.* down to the compressor urethræ muscle, and the other which passes through to the bladder. These are commonly called anterior

and posterior irrigations, respectively. They are carried out with special nozzles, either of a one-way or two-way pattern, the Janet and Maiocchi being respective examples of each.

This method of treatment is by far the best as a routine. A large amount of lotion is used and, provided that the irrigation can is not placed too high above the patient's penis, no damage can be done. The apparatus consists of an enamelled iron can or glass vessel which is either fixed to the wall or suspended on an adjustable pully.

Both anterior and posterior irrigation is carried out from the beginning of a case of anterior urethritis, the anterior being first performed thoroughly to wash out the pus, etc., from the anterior urethra, and being followed by a posterior irrigation, two or three pints of solution being used for the complete lavage. As a general rule, the posterior urethra will not tolerate as strong a solution as the anterior; but as each patient is a rule unto himself in this respect, one must be guided by observation and experience. This applies also to the drug used and to the number of daily irrigations. As regards the latter, it is best to begin on the acute anterior urethritis with a 1/20,000 hot, alkaline pot. permang. anterior and posterior lavage twice or thrice daily for the first week, or until the discharge becomes less purulent, when gradually increased strengths of solution may be used.

As improvement takes place, the number of irrigations should be reduced. Should the symptoms increase during treatment, or the patient complain of pain on irrigation, the strength of the solution and the number of irrigations should be decreased. If progress comes to a standstill, a change of drugs should be tried.

Good results have been obtained from the following combinations:—1/20,000 pot. permang. in the morning, 1/10,000 silver nitrate at midday, and 1/20,000 hydrarg. perchlor. in the evening. Good results have also been obtained by placing acute cases on 1/20,000 pot. permang. every two hours from 7 a.m. to 7 p.m., *i.e.* seven daily irrigations.

Irrigation with a 1 per cent. solution of common salt has recently been advocated and published results are encouraging. It is claimed that there is a lymphagogue action and that the solution does not irritate and dry up the urethra. Pot. permang. on the other hand is astringent and may result in the closing up of the mouths of the follicles, thus leading to chronicity.

43. Anterior and posterior irrigations.—Wash the glans penis with hydrarg. perchlor. lotion, 1/2,000, paying particular attention to the meatus.

If using a two-way nozzle, fix the irrigation can to the 6-ft.

hook, but if using a one-way nozzle, fix it at the 4-ft. hook. Half fill the can with sterile water at a temperature of 108° to 110° F., pour in the necessary amount of concentrated solution to be used and dilute with the required quantity of sterile, warm water. If the concentrated solution is poured in first, a correct mixture will not be obtained.

Attach the Maiocchi or Janet nozzle and open the stop-cock to drive out the air. Insert the tip of the nozzle into the meatus and allow the solution to run into the urethra, the patient remaining standing and wearing a mackintosh apron with a hole in the middle for the penis. The patient steadies his penis with the left hand and holds the nozzle with the right.

While the fluid is flowing from the outlet—if the Maiocchi nozzle is used—the patient should close this with the end of his forefinger, so as to fill and dilate the urethra with lotion. As soon as pressure is felt, the finger is removed but is again applied as soon as the flow has become of even pressure. If a Janet's tube is used, the pressure is varied by withdrawing it slightly from the meatus to allow the fluid to escape, and then, when the pressure is relaxed, pressing the nozzle in again. This should be done twenty or thirty times during irrigation. Use one pint for this and leave two pints for posterior irrigation.

For a posterior irrigation, raise the can to the 6-ft. hook, if using a one-way nozzle. Insert the nozzle into the meatus, closing the outlet in the case of the Maiocchi, and tell the patient to try to urinate into the tube; this relaxes the compressor urethræ muscle and the fluid passes back into the bladder.

On no account must force be used for this. Allow the patient's bladder to fill until he feels slight discomfort, tell him to retain the fluid for a couple of minutes then void it. Repeat the whole process twice more or until the last washing retains its pink colour. When all the fluid has been used, the patient removes the nozzle and places it in a receptacle provided for the purpose, from which the orderly removes it for sterilization; he then places the end of the rubber tubing into a vessel containing antiseptic solution fixed close at hand and finally washes his hands thoroughly.

Patients should be warned to be very gentle and careful with the nozzles, as any irregularity of surface is apt to injure the delicate mucous membrane of the urethra. Such injury is apt to become a focus for further infection.

Except as part of the abortive treatment, where a small quantity of fluid is used, injection by means of a hand syringe is not advised and will not be described.

44. Antiseptics used for Urethral Irrigations.—

The number of these is legion, but the following are perhaps those of most value :

Pot. permang.—1/20,000 to 1/6,000.

This solution must be given at a temperature of from 106° to 108° F. and made alkaline by the addition to each pint of 1 drachm of a 1 per cent. solution of sodium carbonate.

Silver nitrate.—1/10,000 to 1/4,000.

Given cold ; especially in chronic cases and before and after instrumentation. Its effect must be carefully watched.

Perchloride of mercury.—1/30,000 to 1/20,000.

For mixed infections.

Oxycyanide of mercury.—1/10,000 to 1/4,000.

Should only be given for two consecutive days, as it is liable to set up a chemical urethritis. For mixed infections.

Acriflavine.—1/6,000 to 1/4,000.

With normal saline.

Mercurochrome—220.—1/6,000 to 1/2,000.

Chloramine—T.—1/6,000 to 1/4,000.

Zinc sulphate.—1/4,000 to 1/2,000.

Stimulating and astringent.

Zinc permanganate.—1/8,000 to 1/4,000.

Stimulating and astringent.

Zinc sulphanilate—Nizin.—1/500 to 1/250.

Copper sulphate.—1/4,000 to 1/2,000.

Picric acid.—1/2,000 to 1/500.

In resistant cases, but watch carefully for intolerance.

Boric acid.—1 per cent.

Used for diagnostic purposes and at the end in old chronic cases.

Eusol.—0.5 per cent.

Surgical principles are not always observed in making up solutions for lavage, and while it is acknowledged that secondary organisms inhabit the urethra in normal health and do no harm, yet, once the mucous membrane has been injured by the gonococcus, it is highly probable that these previously harmless organisms acquire pathogenic properties. There is, therefore, no need to burden the already devitalized mucous membrane with fresh infection with each lavage ; hence the water used for diluting each lavage solution must be sterilized. The irrigation reservoirs must also be sterilized before each batch of cases make use of them.

45. Drugs for Internal Administration.—*Cubebs* and *copaiba* have no specific action, are of little use and only tend to upset digestion.

Cedarwood oil has been used a good deal in France with reported good results.

Sandalwood oil acts as a mild urethral sedative and, prescribed in the form of mist. santal co. (*see* Appendix VII) and given in warm milk, is less likely to cause nausea or digestive disturbance.

Urotropine is irritating to the mucous membrane in the acute stage, and is of no value except in acid urine when formaldehyde is liberated. It is useful in cystitis and must be preceded by acid sodium phosphate.

Buchu is a diuretic and as a tincture or infusion—the freshly made infusion is much the more effective—is useful in combination.

Hyoscyamus, as tincture, is used in combination as a sedative.

Potassium citrate, in combination, is of use as a sedative and diuretic.

46. Accessory Treatment.—Accessory treatment by intravenous, intramuscular, hypodermic or intradermal chemotherapy is often used with the object of stimulating or reinforcing the resisting mechanism.

S.U.M. 36, intramuscularly in three doses of 0.002 gramme at intervals of five days, has been tried in the early stages of acute anterior urethritis with but indifferent results. In posterior urethritis, at the time when complications usually arise, and specially when such complications threaten or have arisen, the use of such treatment has been found of some value.

The following drugs are of use in the treatment of complications of chronic gonorrhœa :

Collosol manganese and manganese butyrate is given intramuscularly and repeated two or three times at intervals of five days. Initial dose, 0.5 c.c. and increased up to 1.5 c.c. Both are useful in cases of secondary infection and somewhat better results have been obtained with the latter.

Intramine, triamine and contramine are also used for the same purpose and in the same doses but with indifferent results.

Aolan—sterile, fat free, lactalbumin. This may either be given intradermally in doses from 1 to 2 c.c. at two-day intervals or intramuscularly in 5 to 10 c.c. doses at five-day intervals. This substance has been found to be of undoubted value in chronic cases, especially in prostatitis and in cases with complications. In India, a substitute, manufactured under the trade name of "Lactumin," has been found to be

even more efficacious—possibly because it is prepared, in part at any rate, from buffalo milk.

Serum in the form of normal horse serum, antistreptococcic, antistaphylococcic or antimeningococcic, has given satisfactory results in the treatment of local and metastatic complications. Two or three subcutaneous doses of 20 c.c., at two-day intervals, may be given.

Protein shock has been found of value in chronic cases, especially those with complications. In addition to aolan and lactumin, mentioned above, T.A.B. vaccine, given intravenously, the maximum dose being 0.25 c.c., well diluted with normal saline, or whole blood injections (autohæmotherapy), has given good results.

47. Vaccine Treatment.—In the past few years considerable advances in the vaccine treatment of gonorrhœa have been made.

There is still much controversy as to the curative value of vaccines in acute gonorrhœa, but it has been proved that their judicious administration does lessen the incidence and risk of complications and gives fewer relapses and that the cases run a milder course. In chronic and complicated cases their value is undoubted. Vaccines, however, cannot take the place of local treatment, which must be carried out as well.

When available, the Woolwich vaccine (gonococcus exotoxin) is to be recommended. This vaccine can be obtained direct from the Officer in Charge, The Central Division, Royal Herbert Hospital, Woolwich, S.E.18.

In the true sense it is not a vaccine, as it contains no organisms, but is a bacterial wash obtained from gonococci grown on a special medium. It is standardized to contain the product of 7,000 million per c.c. As it contains no organisms, it contains no toxins, but it has an exceptionally high antigenic value. Dosage is 1 to 2 c.c. given according to the prognosis of the case—usually weekly. Protein shock in the intervals of vaccine treatment is of additional assistance.

The vaccine must be given intradermally and the usual practice is to divide the dose into three, giving a third into the inner side of each thigh and a third into the skin of the dorsum of the penis. There may be slight general and local reaction with the first dose, but usually there is practically none.

From recent researches it would appear that improved therapeutic results are obtained by giving diluted exotoxin intravenously. The stock vaccine is diluted 1 in 10 with sterile carbol-saline, no heat being used in its preparation, and the resulting solution given intravenously, beginning

with 2 c.c. and increasing by 1 c.c. at weekly intervals up to 7 or 8 c.c. There is a moderately severe general reaction with the initial doses—pyrexia, nausea, sometimes vomiting and diarrhœa, headache, pains in the joints, especially the arm in which the injection is made, and labial herpes. Intravenous and intradermal administration may be combined. Under this form of treatment, gonococci disappear from the smear with marked rapidity and the urethral discharge tends to dry up.

As regards other vaccines, it is impossible to lay down hard and fast rules as to dosage, etc., owing to the difference in susceptibility of patients; the danger to be avoided is the production of a long negative phase. British practice is to give 5 to 10 million organisms in acute cases and 150 to 200 million in chronic, while the American school gives 50 to 100 million in acute cases and 500 to 1,000 million in chronic. Interval between doses is as important as actual dosage. An autogenous vaccine is best where it is obtainable.

A combined vaccine, *e.g.* gonococcus and staphylococcus and/or diphtheroid, etc., is of great value in many cases; in fact such good results have been recently obtained with a mixed exotoxin at Woolwich that this mixed vaccine is used in all cases.

Detoxicated vaccines have given good results, but it must be remembered that the process of detoxication also reduces antigenic value. Very much larger doses are therefore required.

Good results are also claimed for certain proprietary vaccines, amongst which may be mentioned Gono-Yatren and Arthrigon; both are particularly useful in cases complicated by arthritis.

48. Treatment of Chronic Gonorrhœa.—In general, the treatment of chronic gonorrhœa continues on the same lines as in acute, but more drastic measures are required. Treatment of this condition usually depends on the efficient treatment of complications.

No pains should be spared in mastering urethroscopic technique, as the urethroscope is a very valuable instrument in the hands of a skilled operator. The Harrison urethroscope, issued to military hospitals, is simple to use and medical officers should take every opportunity of getting a clear picture of a normal urethral mucous membrane. In the diagnosis and treatment of complications occurring in the anterior urethra, this instrument will be found invaluable.

For infiltration and stricture, early systematic dilatation is necessary, but if these can be diagnosed and treated in the soft infiltration stage, it is unlikely that the latter, and much

more serious, condition will arise. Potassium or sodium iodide may be given internally to aid absorption.

In littritis and lacunitis, the correct treatment may be described as preventive, as this condition may be prevented by the passage, as soon as the acute stage has subsided, of a straight metal sound with palpation and massage over it. This empties any infected glands and so tends to prevent the infection becoming chronic.

Kollmann dilators are now almost museum pieces and should be used only extremely rarely and only in well established chronic cases in addition to lavage.

For erosions, granulations, etc., lavage with non-irritating solutions and gradual gentle dilatation will often be found sufficient; if not, the urethroscope will be necessary for local applications and other treatment.

In inflammation of the verummontanum and sinus pocularis, local instillations of a 5 per cent. silver nitrate with an Ultzmann's syringe may be given, failing which local applications through the urethroscope may be required.

In all cases prostatic and vesicular massage should be carried out until there is neither turbidity of the urine nor gonococci present following this massage.

General treatment must go hand in hand with local; protein shock, *e.g.* aolan, manganese, butyrate, etc., as required.

49. Treatment of Complications of Anterior Urethritis.—*Acute retention of urine.*—Sitz baths, bed, suppositories; suspend local treatment temporarily.

Suppositories containing atropine, grs. $\frac{1}{15}$, in combination with extract of belladonna, grs. $\frac{1}{4}$, appear to give better results than those containing atropine alone. If there is much pain and discomfort, acetanilide, grs. 4, or morphine hydrochlor., grs. $\frac{1}{6}$, may be added to the atropine and belladonna. Ichthyol, grs. 5, is also of value (*see* Appendix VII).

Chordee.—When not relieved by micturition or cold sponging, camphor monobromate, grs. 7, t.d.s., may be given in cachets.

Balanitis and balano-posthitis.—Mild antiseptics such as eusol, methylated spirit, biniodide of mercury or weak aqueous solution of picric acid, 0.5 to 1 per cent., are effective. A layer of gauze soaked in the antiseptic should be placed between the glandular and preputial mucous membranes. When it has cleared up, the advisability of circumcision must be considered.

If there is marked oedema and swelling, wash out the sac and apply a fomentation of a saturated solution of magnesium sulphate to the prepuce. If there is gross ulceration, slit the

dorsum of the prepuce from the opening to the coronal sulcus and remove a V-shaped wedge of tissue—a circumcision may have to be performed later, when the infection has subsided, for cosmetic effect. Dorsal slit or circumcision may be done under local anæsthesia, but a general anæsthetic—evipan sodium is usually sufficient—is more satisfactory.

If the apparatus is available, surgical diathermy is an excellent means of performing the operation. The subject is further dealt with under soft sore.

Folliculitis.—This has already been dealt with under littritis and lacunitis. In addition to the treatment referred to, however, chronic follicles may be dealt with by cauterization with the actual cautery, destroyed by silver nitrate fused on a probe or by diathermy; the operation being performed through the urethroscope. After such treatment, the follicles must be massaged over a sound.

Cowperitis.—Bed, purgatives, sitz baths, hot applications of glycerine and ichthyol or antiphlogistine. If there is abscess formation, the abscess should be aspirated through a hypodermic needle in the perineum and the abscess cavity washed out with a weak aqueous solution of tincture of iodine. An abscess bulging into the perineum should be opened under anæsthesia as follows: Wash out the urethral canal and pass a straight bougie, incise the skin surface and expose the abscess wall, which is then punctured with sinus forceps. Wash out the cavity and insert a drain. Administer suppositories for two or three days afterwards.

Periurethral abscess.—Wash out the urethra, instil 2 c.c. of a $2\frac{1}{2}$ per cent. solution of novocaine and pass a full-sized straight bougie. Press the abscess gently against the bougie in an endeavour to burst it into the urethra. If this fails, the abscess may be incised through the operating urethroscope. After evacuation the cavity should be washed out with tincture of iodine or $\frac{1}{2}$ per cent. silver nitrate. If the abscess is bulging towards the skin surface and only a general redness can be seen in the urethra, it should be aspirated with a hypodermic needle and the cavity washed out with weak aqueous tinct. of iodine; subsequent treatment should be with magnesium sulphate fomentations. The abscess may even have to be incised through the skin but this course must be avoided, if possible, as there is a danger of urethral fistula resulting.

Fibrous stricture.—The formation of a stricture should be avoided if treatment has been efficient. The treatment of this condition is too big a subject for these memoranda and medical officers are referred to text books on venereal diseases.

Urethral fistula.—Plastic operation is the only treatment for this and results are disappointing.

Tysonitis.—If the gland and duct are inflamed, they should be washed out through a blunt-pointed hypodermic needle. An effective method of treatment is to cauterize the duct with silver nitrate fused on to the stilette of a hypodermic needle. In addition, the glands should be massaged to express the pus.

50. Treatment of Complications of Posterior Urethritis.—*Prostratitis, acute*.—Bed, milk diet, barley water *ad lib.*, purgatives. Hot sitz baths followed by fomentations to the perineum; rectal lavage with hot boric lotion (temp. 116° to 120° F.). Suppositories are usually required. If available, prostatic diathermy is of great assistance. When the inflammation subsides, give a nourishing diet and recommence urethral irrigations and prostatic massage.

Prostatic abscess.—As for acute prostatitis. Once the abscess has burst, resume lavage but do not have the reservoir higher than three feet above the pelvis.

As the majority (60 to 70 per cent.) of cases rupture spontaneously into the urethra, surgical interference is rarely required. The natural rupture, too, heals rapidly and with a great deal less discomfort to the patient than when incised.

If operation is decided on, the perineal route should be chosen. With the patient lying in the lithotomy position, a curved incision is made through the skin and subcutaneous tissues about an inch in front of and parallel to the external anal sphincter. The central point of the perineum is defined, the transverse perineal muscle is retracted upwards and the fibres of the levator ani muscle are separated by passing sinus forceps through them. The wall of the abscess frequently bulges through the opening so made and it may then be punctured by a vertical incision or with the sinus forceps. During the operation the forefinger of an assistant's hand should be inserted into the rectum as a guide, and to prevent the anterior rectal wall from being buttonholed. The posterior wall of the prostatic capsule has been opened and the operator must pass his finger into the prostatic tissues and break down all loculi and collections of pus. The cavity of the abscess is then washed out and a rubber drain is inserted into it, the end of the drain being left protruding from the anterior part of the perineal incision.

Prostatitis, chronic.—The aim of treatment is to conserve the remaining healthy gland tissue, to restore denuded epithelium, to destroy infecting organisms and to establish and maintain free drainage of the prostatic ducts. All these are best carried out by prostatic massage with the operator's forefinger.

Before massage, the patient's bladder should be filled with mercury oxycyanide solution; he should be placed on the

table in the knee-elbow position and instructed to breathe naturally and to relax the abdominal muscles.

The operator passes the forefinger of the right hand, protected by a well lubricated glove or fingerstall, into the rectum, and notes the condition of the lobes of the prostate and of either seminal vesicle. Having determined the contour and consistence of the parts, the finger is passed from without downwards and inwards in a stroking fashion over the prostate on the right side. The stroking is repeated ten or twelve times and circular rotary massage may be applied to any area that feels nodular or boggy in consistence. The right seminal vesicle, lying above the prostate, is treated similarly, special attention being paid to the ampulla and vas. The left lobe of the prostate and the left vesicle are treated similarly and finally the finger is passed from above downwards, three or four times, along the central groove between the lobes in which the posterior urethra lies.

In the earlier stages the pressure should be light and at no time should the pressure be so severe as to cause more than temporary discomfort. The expressed secretion should be collected for examination; in this condition and in vesiculitis (*see below*), a fresh film in addition to a stained one should be examined, as the presence of living spermatozoa is an indication that cure is being effected. Massage should last from two to three minutes and be repeated every second or third day at first, and should be followed invariably by urethro-vesical lavage, preferably with silver nitrate solution (1/10,000 to 1/4,000), or, if there is a mixed infection, mercury oxy-cyanide (1/8,000). The latter should be given as hot as the patient can stand, 108° to 112° F.

An atropine and belladonna suppository should be given the night before and the morning after massage. Between the massages the passage of a 24–26 (French scale) curved sound helps to open up, or keep opened up, the ducts. Following the lavage after massage, the instillation into the prostatic urethra of a 1 per cent. solution of silver nitrate with an Ultzmann's syringe is useful.

The general treatment is on the lines of nerve tonics, *e.g.* glycerophosphates, strychnine, iron, arsenic, quinine; outdoor exercise not amounting to fatigue. Extract of prostatic fluid has been tried and is said to have been of benefit, also thyroid and pancreatic extracts. Vaccine therapy is indicated. Protein shock is of value and diathermy, when available, is indicated as a valuable adjunct to massage, especially when the gland is hard and nodular.

Vesiculitis, acute.—Do not massage the vesicles in any circumstances. Bed, light diet with instructions to drink

large quantities of water every day; stop all treatment of the posterior urethra. Thoroughly clean out the rectum with a soap and water enema and follow with hot (115° to 125° F.) rectal irrigations every two to three hours, directing the flow against the vesicles, if possible. Hot fomentations to the perineum, hot sitz baths, lasting a half to three-quarters of an hour, twice or thrice daily. If obtainable, ten to twelve leeches to the perineum; atropine and belladonna suppositories with or without ichthyol or, if there is a great deal of pain, opium. If there is retention of urine, in spite of the above treatment, use a gum elastic catheter. If general symptoms of fever, etc., are present, treat symptomatically. Vaccines are indicated. The usual alkaline diuretic mixture should also be given.

Vesiculitis, chronic.—Posterior urethral irrigations, twice or thrice daily and always following vesicular massage. Vesicular massage every other day, or less often, and carried out with a full bladder. The normal secretion of the vesicles is an alkaline, sticky, viscous, mucoid fluid of fair density and is odourless and of a greyish colour—in old men it is said to have a brownish tinge. It contains numbers of transparent, heavy globules like sago grains, which are very characteristic.

The expressed contents from an infected vesicle contains red blood cells, pus cells, epithelial cells, spermatozoa in various stages of degeneration and perhaps gonococci and other organisms. It should be noted that at first the amount of contents expressed may be very little but with perseverance—which is very necessary in these cases—the quantity may surprise one. Sometimes a complete vesicular cast may be shed.

The massage must be continued until there is no pain or discomfort in the region of the vesicles and no purulent debris comes away after massage.

Dilatation of the prostatic urethra, vaccines, protein shock, etc., are also indicated.

Belfield's vasotomy— injection of a 5 per cent. or 10 per cent. solution of collargol or argyrol (about 5 c.c.) into the vesicle through a small hole in the vas—is sometimes indicated.

Epididymitis.

Prophylaxis.—Exercise care in dealing with the posterior urethra and use atropine suppositories before prostatic massage. In the early stages there is only tenderness of the cord and a good purge with sodium or magnesium sulphate, an intravenous injection of sulphostab (0.18 gm.) or vaccine treatment with local application of ice bags may abort the case.

Treatment, acute.—Bed, purgatives, alkaline mixture ; stop all urethral treatment for three or four days and watch the effect. Milk diet with plenty of fluids, vaccine treatment.

Elevate and support the scrotum so that there is no tension on the cords. Hot fomentations or antiphlogistine to the scrotum until the acute pain has ceased ; after which apply on lint either a 20 per cent. ichthyol in glycerine or 10 per cent. belladonna extract in glycerine and cover with oiled silk ; change these dressings once or twice a day. If the latter application is used at the same time as atropine suppositories, a watch must be kept for toxic symptoms.

Cylotropin (Schering), 5 c.c., intravenous, at the beginning of an attack often gives great relief, and soon causes retrogression of the swelling and pain.

Sitz baths twice daily give relief. Good results are obtained with Bier's congestion treatment. It can be applied in any stage, but in the acute stage it gives almost instant relief of pain. A piece of ordinary $\frac{1}{4}$ -in. rubber irrigation tubing is applied round the scrotum above the affected testis and fastened either with a pair of artery forceps or by tying the tubing in a single knot at the required pressure over a length of tape laid at right angles to the tubing and tied off round the knot in the rubber. When there is any difficulty in isolating the affected side, include both testes.

Keep the scrotum well supported. The great essential in this treatment is that it should cause no pain and it will not do so except when applied too tightly. At the correct pressure, the pain from the epididymis ceases almost immediately. Keep the tubing applied for twelve hours daily with an hour's interval in the middle of the day.

Needling : Baermann's procedure is to take a needle with a glass syringe and insert the needle into the whole length of the epididymis and to aspirate as the needle is withdrawn.

Bruck's operation consists in making a small incision—1 cm. long—into the coverings of the globus minor. A modification of this which gives less risk of damaging the tubules is as follows : Make the opening into the fibrous covering of the globus minor just large enough to admit a fine director, then complete the 1 cm. incision on the director ; paint with iodine and dress. This gives instant relief of pain.

Hagner's operation consists in exposing the testis and epididymis and making numerous punctures with a tenotomy knife into the swollen epididymis, but only through the connective tissue. Where pus is seen, the openings are enlarged with a probe and washed out with 1/1,000 hydrarg. perchlor. followed by normal saline. The wounds are closed, leaving in a cigarette-drain down to the epididymis.

Treatment, chronic.—In this stage, the epididymis remains thickened and hard and nodule formation is said to be more common after cold applications during the acute stage than after other forms of treatment. There is little or no tenderness and no pain except sometimes along the cord and up into the groin.

Resume urethral treatment with hot pot. permang. as for posterior urethritis. Prostatic and vesicular massage every three to four days. Give pot. iod. internally. Vaccine and protein shock. Suspensory bandage. Bier's congestive treatment or strapping over Scott's dressing or one of the following ointments well rubbed into the affected parts and along the cord: mercury or ammoniated mercury ointment, ichthyol 1 drachm, lanolin and vaselin, of each $\frac{1}{2}$ drachm.

To strap a testicle, first isolate it with a ring of strapping above, tight enough to prevent it slipping back into the upper part of the scrotum, then apply strips of strapping over and round the testicle so as to cause even pressure.

Belfield's operation consists in opening into the vas and injecting 25 minims of any selected drug (argyrol, etc.) along the vas towards the seminal vesicles.

The risk in all operative procedure is damage to the tubules with resulting complete obliteration and sterility. Surgical interference, however, is not called for in the majority of cases and, if good results are to be expected, these cases must be carefully selected.

51. Treatment of Metastatic Infections.—In acute cases, absolute rest in bed, and on milk diet if the temperature is raised, and with a cradle if the lower limbs are affected. During sleep the joints may be immobilized with splints, but if these are retained too long, adhesions will result. Care must be taken not to allow the patient to lie in bed too long in one position as contractures and adhesions rapidly occur.

If there is great effusion into the joint, aspiration is necessary to prevent stretching and subsequent laxity of the capsule and ligaments, and should be followed by hot fomentations. The strictest asepsis must be ensured in carrying out this form of treatment.

Stock vaccines must be given from the start and give good results. Autogenous vaccines, if available, give the best results. Intramuscular injections of intramine (1·5 c.c. on the first day, 1·5 c.c. on the third, and 2·5 c.c. a week later) have also been recommended.

Hot fomentations every four hours; hot air or Bier's congestion (ten hours at a time and twice in twenty-four hours) are good. In these conditions, diathermy is of great value both locally to the affected part and to the focus of infection.

Paint the joints with one of the following : Equal parts of tinctures of opium and iodine, glycerine of belladonna, 20 per cent. ichthyol in glycerine or equal parts of a saturated solution of magnesium sulphate, alcohol and lotio plumbi subacetatis fort.

Two points require special mention. The primary focus of infection in the posterior urethra, prostate or seminal vesicles must be found and thoroughly treated ; and, secondly, as there is very rapid wasting of the muscles of the affected limb, massage or other suitable treatment must be given from the start and passive and voluntary movements as soon as practicable to avoid adhesions.

In chronic cases and where resolution is slow, the original focus in the genito-urinary tract must be energetically treated and a course of vaccines given. Protein shock with aolan given intramuscularly or the intravenous injection of T.A.B. vaccine in doses of 120–180 to 150–220 million may be given every four to five days according to the reaction produced. Unless a good reaction (as seen by temperatures, etc.) is produced, no good will result. Subcutaneous or intramuscular injections of the patient's own blood may be tried, 3 c.c. in the former and 5 c.c. in the latter.

Gonorrhœal septicæmia, when it occurs, is treated on ordinary lines ; luckily this severe complication, which is usually fatal, is rare. Mercurochrome, given intravenously, in 0·5 per cent. solution and mixed with glucose—2 to 5 mgm. of the drug per kilo. of body weight—have given good results. Other forms of treatment are : daily intravenous injections of 10 c.c. of a 1 per cent. solution of collargol in normal saline, to a total of 30 to 40 c.c., intravenous injection of electrargol 5 c.c., or of luargol 0·05 to 0·1 mgm., antigonococcal serum 15 to 25 c.c., repeated in twenty-four or forty-eight hours.

52. Treatment of Extragenital Infections.—Proctitis.—

This condition is not common in the male but is sometimes met with. It reacts favourably to frequent hot douching with pot. permang., acriflavine or mercurochrome, etc., of the usual strengths.

Gonorrhœal ophthalmia.

Prophylaxis.—All patients must be warned of the risks of infection and impressed with the necessity for the most scrupulous cleanliness after manipulation of the penis. A penis bag should be given to each case to prevent soiling of the clothes. The hands must be washed in the irrigation room after each treatment and special towels kept for drying them. Patients must be warned to report at once any discomfort, redness or discharge from the eyes.

Treatment.—Take a smear from the infected eye, stain with Gram and examine. It is important that the gonococcal origin of the infection should be verified, but do not postpone active treatment pending the result of the smear.

As a rule, only one eye is infected. Examine carefully the unaffected eye, and if satisfied that there is no infection there, wash round the eye on the cheek, forehead and eyelids with ether or spirit soap, then with warm sterile water. Finally wipe over with a little ether and apply a watch glass mounted with adhesive plaster so as entirely to shut off the eye. A small opening in the plaster may be left at the outer side to prevent clouding of the glass.

For the infected eye free drainage is essential.

Irrigations.—These should be frequent; every half hour during the day and hourly during the night. The main consideration in irrigations is to prevent the secretion remaining in the conjunctival sac. As the secretion becomes less, the times between irrigations should be increased. The irrigating fluid should be bland, *e.g.* 1/10,000 pot. permang., made up with normal saline, or normal saline itself.

Much depends on the efficiency of the irrigations; the lids should be handled gently with cotton wool in gauze on the fingers to facilitate opening them effectively, and they should be gently manipulated during irrigation so that any secretion lodged in the conjunctival sac, or sticking to the cornea, is washed off.

The lids should be smeared with ung. boric. to prevent them sticking together.

Protein shock.—Next to irrigations, probably the most important therapeutic measure is the injection of foreign protein.

Eight to 10 c.c. of whole milk, boiled for four minutes, should be given intramuscularly. This may be repeated for three or four doses, every third day.

If milk produces no febrile reaction, typhoid vaccine should be substituted.

Ice compresses.—These are of value in the early stage when there is much swelling, but should not be continued longer than twenty-four to forty-eight hours.

Atropine.—If there is any sign of involvement of the cornea, one drop of a 1 per cent. solution of atropine sulphate should be instilled into the eye three times a day.

Transportation.—If the case is being transported from one hospital to another, on no account should the infected eye be bandaged. An eye shade may be worn. A special orderly should be detailed to accompany the patient, and should continue irrigating the eye as frequently as circumstances permit.

The use of silver nitrate is dangerous and out of date.

If ulceration of the cornea takes place, carry out the above treatment and, in addition, hot fomentations every four hours. Castor oil drops applied tend to ease the pain. If perforation takes place, excision of the eye is necessary.

In the acute stage where there is much swelling, intra-muscular injections of 1 c.c. of collosof manganese have given good results. Repeat every third day, if necessary. Where indicated, canthotomy may be performed.

In treating gonorrhœal ophthalmia there are three essential points to be observed :

(1) The medical officer should carry out all the initial treatment himself and should personally instruct the orderly or whoever may have to carry out the routine treatment. The details of such treatment should always be in writing.

(2) Warn the patient that he will lose his eye, or have permanent damage, through any interference with or neglect of his treatment.

(3) Do not uncover the sound eye (provided that it remains uninfected) until all discharge has disappeared from the infected one and there have been several negative smears for gonococci.

53. Instrumentation.—In all cases of gonorrhœa in the male, instrumentation is required at some time. It must be borne in mind, however, that the urethral mucous membrane is one of the most delicate structures in the human body. It follows, therefore, that the greatest gentleness must be exercised in the use of this form of treatment and that it should be only carried out when indicated. More harm is done by too much mechanical interference than by too little.

Sounds.—These may be described as of two kinds—anterior, or straight, and curved, the latter being a combination of anterior and posterior. The straight sounds are of metal, while the curved are of metal or gum elastic. For sterilization, gum elastic sounds should never be boiled but placed in strong antiseptics or formalin vapour ; metal sounds should be boiled. As regards shape, the anterior straight are of torpedo pattern, *e.g.* Wyndham Powell's or Canny Ryal's, and dilating, like Watson's, where the greatest diameter extends backwards only for about 9 cm. from the tip ; in general outline they are somewhat like the shape of the old-fashioned poker. Straight sounds penetrate only as far as the bulb. Wyndham Powell's are made in the French scale in sizes 15 to 32 while Watson's are also made in the French scale, the smallest being 10/14 and the largest 26/30.

Gum elastic bougies may be of the acorn tip or olivary type and give valuable information as regards infiltrations and tender spots, especially when being withdrawn, when the shoulder is gripped by the infiltration. As a rule the acorn tip type should not be passed further back than the bulb.

The olivary type is used chiefly for cases in which it would be unsafe to use metal sounds, *e.g.* infiltrations which do not admit a bougie of more than 15 F.

Curved metal sounds are of many patterns—Lister's, Liston's, Clutton's, Benique's, Nicoll's, Watson's, etc., of which Clutton's or Watson's types are to be preferred with their shorter beaks.

There are three scales in common use for these sounds—the French, or Charrier, which mounts by thirds of a millimeter, Guyon's in sixths of a millimeter and the English. The usual pattern in the Army has four sizes on each sound from the tip to the thickest part of the curve.

COMPARISON OF ENGLISH AND FRENCH SCALES

English	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18.
French	5	6	8	9	10	12	14	15	17	18	20	21	23	25	26	27	28	30.

A few years ago a new standard catheter gauge was introduced in which each size increased by 0.5 mm. from No. 00, which equalled 0.5 mm. diameter, No. 0—1 mm., and so on up to No. 30—16 mm.

Some rules for the use of sounds.—(1) Never use them in an acute inflammatory state of the urethra.

(2) The patient should have an irrigation with 1/8,000 solution of silver nitrate or oxycyanide of mercury before the passage of sounds and should retain 3 or 4 oz. in his bladder until after instrumentation.

(3) Never use force.

(4) Slow dilation is better than rapid ; aim at a one number increase every four days.

(5) After withdrawal of the sound, "milk" the urethra and examine the product. A decrease in the pus-epithelial ratio is of good prognosis. Tell the patient to empty his bladder into a urine glass for inspection.

(6) If any blood is produced (except from splitting of the meatus), do not repeat instrumentation for at least eight to ten days.

(7) If the meatus is narrow, do meatomy, cutting down towards the frænum, cauterize or keep in a piece of silkworm gut, etc., to prevent primary union.

(8) In subsequent treatments, begin with one or two sizes less than the largest sound used on the last occasion.

(9) Never immediately precede instrumentation with a permanganate irrigation.

(10) In infiltrations and strictures after attaining to 25 or 26 F., use a dilator for higher dilations.

(11) Record on the case card all instrumentations with dates and sizes attained.

(12) Use sterile liquid paraffin as a lubricant.

Ultzmann's and Guyon's Syringes.—These are used for instillations where it is desired to inject from one to twenty drops of a strong medicament into one region of the urethra where the disease is localized. Silver nitrate, 1 to 5 per cent. solution, is the usual drug.

In using either instrument, before introducing the catheter portion, see that it is full of the reagent to be applied. The bladder should be emptied after instillation. Repeat according to the symptoms.

Urethrosopes.—These may be divided into two kinds, those using reflected light from an external lamp, and those with an internal lamp. Wyndham Powell's is one of the best of the former pattern and Harrison's or Campbell's of the latter.

The uses of the instrument are twofold—diagnostic and for treatment. It must never be used in the acute stage of the disease.

As a rule, it should not be used more than twice a week in any case and, when it is used, swab out the urethra immediately after withdrawing the obturator. A pair of Kelly's crocodile forceps should be at hand whenever the instrument is used.

In experienced hands the urethroscope is of the greatest value in clearing up chronic infections by allowing of an accurate diagnosis and localization of the remaining infection; also for actual treatment through the instrument or for observing and controlling the effects of treatment.

Dilators.—These are of the straight and curved types, the former for the anterior urethra and the latter for the posterior or for both anterior and posterior. They may be flushing or non-flushing. Kollmann's flushing is the best dilator.

For equipment, a straight and a curved are necessary, but of the latter the pattern recommended is one in which the expansion is limited to the prostatic urethra when the instrument is in situ and having only five expanding blades.

These instruments should be rarely required if the case

has been properly managed, but if they are used, great care must be taken and the following points observed :

(1) The lotions recommended for irrigation are mercury oxycyanide, 1/8,000, or silver nitrate, 1/8,000.

(2) No anæsthetic must be used, but careful attention must be paid to the patient's sensations. It must be remembered that these form the guide to the amount of dilation possible.

(3) Turn the handle until the patient feels a stretching of the urethra, wait five minutes, then resume very gradually and gently. Do not increase more than one number at a time after the patient has first complained of stretching and, when up to the higher numbers, do not increase by more than half numbers at a time. (The instrument should always be examined for play, etc., in the scale before it is inserted in the patient.)

(4) It is necessary to dilate up to 25 F. or 14 E. with sounds before the dilator can be used.

(5) If no hæmorrhage occurs, repeat once or twice a week. If there are any signs of bleeding, either during or after dilation, rest for ten to fourteen days.

(6) As regards the extent of dilation, this varies with the patient, but the following are the limits (in the French scale) :

Penile urethra—30 to 35 ; bulbar—40 to 45 ; membranous—27 to 30 ; prostatic—40 to 45. When doing posterior dilation, it is advisable to precede this by adtropine suppositories the night before and the morning of the sitting.

(7) Use sterile liquid paraffin as a lubricant.

Care of dilators.—After use, dry carefully with a cloth and syringe some spirit along the flushing channels. Then place in a tall bottle or jar containing one part of lysol and nine parts of alcohol. Before use, rinse thoroughly in boiled water and allow some irrigating fluid to run through.

54. Standard of Cure.—The following conditions are necessary to establish a cure :

(1) Absence of urethral discharge.

(2) Absence of gonococci in the fluid of either urethral or prostatic discharge after instrumentation or massage.

(3) Absence of clinical evidence of disease.

(4) Urethroscopic examination or examination over sounds and prostatic massage reveal no evidence of active disease.

So-called " tests of cure " which rely on installations into the urethra of irritants such as magnesium chloride, silver nitrate, etc., should be avoided. They are not reliable tests and are not specific, and, if an inflammatory condition is set up, the resulting condition becomes very chronic and

resistant to treatment. The specific test of instilling endotoxin prepared by autolysation of gonococci is reliable but, if positive, sends the patient into a negative phase which considerably delays cure.

55. Gonorrhœa in the Female.—The army medical officer is but rarely called upon to treat gonorrhœa in the female but cases do occur and a short summary of the differences encountered will not be out of place.

The patient may present herself for examination for the following reasons :

- (1) She has run the risk of infection.
- (2) Her husband has had gonorrhœa and has sent her up to see if he has passed on the disease.
- (3) She has had gonorrhœa and treatment for it and now wishes to learn if she is cured and fit for marriage.
- (4) She has read notices concerning venereal diseases in public lavatories and wishes to be reassured concerning the discharge which she had previously regarded as of no consequence.

56. Clinical Course and Complications.—In the female, the commonest sites of infection are the urethra, the cervix, Bartolin's glands, the vulva and the vagina.

In most cases the cervix and urethra are simultaneously affected. The vagina tends to be infected in the very young or the very old, or else in pregnant women. The rectum is involved more often than is usually thought.

The chief symptoms are :

Frequency of micturition accompanied by smarting or burning pain ; painful swelling in the vulva (an abscess of Bartolin's glands), or in the groins (inflamed glands or bubo). Painful joints ; ophthalmia.

Acute endometritis.—This is rare and occurs most frequently after a period, miscarriage or childbirth. There is marked suprapubic pain and there may be rectal or bladder tenesmus.

Acute salpingitis.—This most often results from chronic endometritis (which is a common sequela of chronic cervicitis). There is a history of discharge and of irregular and prolonged periods, preceding the onset of acute pain in the lower abdomen.

An acute attack of gonorrhœa in the female, as in the male, begins with a discharge, from the vagina in this case, either increasing in amount or changing in character if the patient has previously suffered from leucorrhœa. In a recent case, the discharge is yellowish-green in colour, staining the linen and stiffening on drying.

Examination of the patient.—The patient is placed in the modified lithotomy position, and the vulva examined in a good light.

In the acute stage, the vulva is generally inflamed, with bright red macules scattered over the mucous membrane, particularly round the orifices of the urethra and Bartolin's ducts. It is bathed in a purulent discharge and is sometimes so inflamed and sore that a speculum cannot be passed without causing abrasions and severe pain. The parts should be cleansed and films taken from the urethra and Bartolin's ducts. The condition of the hymen and the walls of the vagina should be noted. If the inflammation is very acute and the examination causes pain, further investigation should be suspended for a day or two until the parts have settled down somewhat after treatment.

The vulva and vagina should then be thoroughly cleansed with pot. permang. and a vaginal speculum passed. The condition of the cervix should be noted and films taken from it. The rectum should not be examined until the acute stage of the disease is over, unless the symptoms definitely point to infection there.

57. Treatment.—Rest is even more important than in the male and the same dietetic, diuretic, accessory and vaccine treatment is indicated.

The patient should be warned about the infectivity of the discharge and especially about permitting sexual intercourse, even with a person who already has the disease. In this way, husband and wife can constantly reinfect each other and nullify the most careful treatment. Even if precautions are taken to prevent reinfection, the local congestion involved will indefinitely prolong the course of the disease in both parties.

Local treatment in acute cases.—In early acute vulvitis, local treatment is limited to hot sitz baths, of pot. permang., 1/10,000, and frequent bathing of the parts with the same solution. The vulva should not be left wet, but should be carefully dried and a good antiseptic dusting powder applied.

If pain is severe, hot fomentations of boric lint, sprinkled with laudanum or lotio plumbi cum opio, are applied to the vulva. Calamine lotion on lint is sometimes soothing.

Complications such as bartolinitis, with or without abscess formation, vaginitis, etc., are treated as are similar types of condition in the male, but it must be remembered that the female organs will stand, and require, stronger solutions than is the case in the male—*e.g.* pot. permang., 1/8,000 to 1/4,000. In addition, owing to the tenacious mucoid discharge of the female, douching with sodium bicarbonate, a teaspoonful to the quart, is usually required to precede the pot. permang.

Local treatment in chronic cases.—When the hyperacute stage has settled, or in the usual type of milder onset, the following treatment is indicated :

(1) Remove mucoid deposits by thoroughly swabbing with a saturated solution of sodium bicarbonate (or with liquor potassæ).

(2) Douche with weak, watery solutions of antiseptics, *e.g.* pot. permang., 1/4,000, dichloramine—T, 1/1,000, acriflavine, 1/4,000, mercurochrome, 1 to 5 per cent., which aim at keeping the mucous surfaces clean and the various ducts unobstructed.

(3) Coagulating solutions applied to the less delicate membranes produce a necrosis of the superficial layers of the epithelium, which is cast off, *e.g.* picric acid in glycerine, 50 per cent., iodized phenol, camphenol, strong solutions of silver nitrate, copper sulphate, etc. Excess of these solutions must be mopped away.

(4) Glycerine solutions of mild disinfectants have a hygroscopic action and hence tend to drain the superficial tissues towards the surface, *e.g.* glycerine of borax, glycerine of anosol, glycerine of iodine, etc.

Methods of treatment.

(1) *Irrigation.*—Many special glass catheters have been devised, with a back flow, for washing out the urethra. When the urethra has been washed out, the bladder is filled by passing the instrument into it. When full, the bladder is immediately evacuated by the patient. The process is repeated. The cervical canal may be washed out with a similar instrument, which imparts a backward flow to the irrigating fluid. Skene's tubules and Bartolin's ducts can be washed out by the use of a fine, blunted needle attached to a hypodermic syringe.

(2) *Application of coagulating fluids, etc.*—Preparations of this type are applied on sponge holders, Playfair's probes or throat swab sticks.

(3) *Pessaries and tampons.*—Medicated pessaries, containing mercurochrome, protargol, spuman and protargol, etc., are inserted into the vagina and pushed into the posterior fornix close up against the cervix. After the pessary has been removed, the vagina is douched out and it is an advantage to insert another pessary containing either lactic acid, a mixture of lactic acid bacillus and lactose or of yeast and cane sugar.

Instead of a pessary, the vagina may be left packed with a yard of gauze, folded longitudinally in three and soaked in

colloidal silver or in one of the following : First week, glycerine of borax, 10 per cent. ; second week, glycerine of anosol, 5 per cent. ; third week, glycerine of eucalyptus, 5 per cent. ; fourth week, the same as the first ; fifth week, the same as the second, and so on.

(4) *Urethral pencils*.—These are effective and easily inserted.

Diathermy promises well, especially in the chronic stage, but it needs special experience.

The treatment of chronic endometritis or of pelvic complications is best left to the gynæcologist.

58. Gonorrhœa in Children.—Officers called upon to treat military families may have to deal with gonorrhœa occurring in children. A short description, therefore, of ophthalmia neonatorum and vulvo-vaginitis will not be out of place.

Ophthalmia neonatorum.—Many cases of this disease are due to other organisms, staphylococcus, bacillus coli, etc., but most cases, and practically all the severe ones, are due to gonococcal infection. The onset begins about forty-eight hours after birth.

If it shows itself after the fifth day, the infection is probably conveyed by a towel or finger or from the baby's vaginitis, contracted at birth. The symptoms are the same as in ophthalmia in adults and blindness and destruction of the eye may result. As a rule, however, the symptoms are less acute than in the adult, but both eyes are generally affected. The swelling of the lids is more pronounced but the ocular conjunctivæ is less involved. It has on rare occasions given rise to a general gonococcal infection.

The vast majority of cases of children blinded from birth result from this disease, treatment either having come too late or not having been sufficiently energetic. Even with efficient treatment, chronic hypertrophy of the eyelids, scarring and bands connecting the palpebral and bulbar conjunctivæ, opacities in the cornea and cataract may result.

Vulvo-vaginitis.—The genital tract of the female child may be infected either directly by personal contact or indirectly by contact with articles soiled by discharge containing the living gonococcus. Of these, the indirect method is much the commoner.

The child may feel soreness of the vulva and micturition may be so painful as to cause voluntary retention and screaming on micturition when the limit of voluntary retention is reached.

The vulva is inflamed and swollen and there is usually a profuse, yellow discharge sticking the labia together. As

separation of these may cause the most acute pain, an anæsthetic will often be necessary for the initial examination and treatment. When the labia are separated, the vestibule can be seen to be bathed in purulent fluid. Since other organisms can cause a similar condition, especially when vitality is low, the discharge must always be proved microscopically to be of gonococcal origin. The vagina may or may not be infected ; the vestibule must therefore be cleansed with great care and, as only mild disinfectants can be used, in as much as the parts are sore, the swabs should not be wet enough to cause flooding of the vagina with the diluted discharge.

59. Treatment of Gonorrhœa in Children.

Ophthalmia neonatorum.

Prophylaxis.—Every adult patient and every person in charge of a case of gonorrhœa must be warned of the danger to the eyes of the patient and all those likely to handle infected material. The nurse should wear gloves and protective goggles in case of inadvertent splashing in irrigation. All material used in cleansing must be burnt or disinfected. In case of unilateral ophthalmia, the sound eye must be protected with a glass shield.

Against ophthalmia neonatorum, vigorous treatment of the gonorrhœal cervicitis should be carried out during pregnancy. During parturition, the vagina may be disinfected by douches of a weak solution of pot, permang. or lysol, or by the application of a strong solution, such as brilliant green or crystal violet, to the cervical canal and vagina. Some authorities believe that the vagina should be dabbed with protargol.

As soon as the head is born, the eyes are carefully wiped out with boric acid lotion, dried and a drop of 1 to 2 per cent. silver nitrate instilled (10 per cent. argyrol may also be used).

Treatment.—As for gonorrhœal ophthalmia (*see* para. 52).

60. Vulvo-vaginitis.—The vagina should be swabbed out with protargol solution through a speculum, by means of a Playfair's probe. The cervical canal is swabbed with protargol only if infected but the same swab must not be used for the cervix as for the vagina. If the vagina is infected and the hymen prevents drainage, the latter must be sacrificed. The nurse should give the child a vaginal douche twice a day after the vulva has been thoroughly cleansed.

Some advocate a rubber, others a glass, urethral catheter ; in either case, the catheter is passed along the posterior wall and will reach the roof of the shallow vaginal vault after

passing in from between $1\frac{1}{2}$ to 2 in. The head of pressure of the douche must not be more than 2 ft. If a glass syringe is used, a slight backward pressure on the vulval orifice will prevent any intravaginal tension. Milton or eusol, 1 drm. to the pint, or pot. permang., 1/8,000, may be used.

The child may then have a hot sitz bath, pot. permang., 1/10,000, for half an hour. The vulva is next dried scrupulously and a simple dusting powder applied on a pad between the labia and kept in position by a bandage. Over this the child wears loose knickerbockers during the day-time and closed sleeping combinations at night.

Additional treatment will be necessary and this varies. Some surgeons inject after each nightly douche and sitz bath 1 drm. of collosol argentum, and hold the legs up and lift them over a pillow for ten minutes before the vulva is dried as above. Others swab out the vagina once a week with tincture of iodine, 1 drm. diluted with glycerine to the oz., and gradually increasing the proportion of iodine until equal parts are used. If unhealthy granulations occur, they are painted through a speculum with silver nitrate, 20 per cent.

The possibility of rectal infection must be borne in mind. It is present so often that some surgeons require daily rectal irrigations (pot. permang., 1/8,000) to be given throughout the whole course of treatment. These irrigations should only be given after the vulva and vagina have been thoroughly cleansed and before the sitz bath. A low irrigation should be given through a soft rubber catheter passed through a small rectal speculum.

Other young female children should be examined, and, if not infected, removed from the house if possible. The child is confined to bed in a well ventilated room, at any rate for the first two or three weeks. The mother must be specially warned of the danger of drying the child's tears with anything but a perfectly clean handkerchief.

61. The Laboratory Diagnosis of Gonorrhœa.—The following modification of Gram's staining by Jensen has been recommended by the Medical Research Council as the most reliable process for diagnostic purposes :

(1) Methyl violet 0·5 per cent. in aqueous solution is used. (Methyl violet (6B) is the best and the solution remains stable for months.)

(2) Strong Lugol's solution is prepared by dissolving 2 gms. of potassium iodide in a little distilled water and adding to this solution 1 gm. of iodine—note that iodine is not soluble in water but is soluble in a solution of potassium iodide. When the iodine has dissolved, make up the volume to 100 c.c.

- (3) Make a thin, even film.
- (4) Fix in the flame, taking care to avoid overheating (test the heated slide against the back of the hand).
- (5) Let the slide cool.
- (6) Stain with the methyl violet for half a minute.
- (7) Pour off the methyl violet and wash off the remainder with a drop or two of strong Lugol's solution. Do not wash off with water.
- (8) Pour on fresh Lugol's solution and leave for half a minute.
- (9) Wash off the Lugol's solution with absolute alcohol (98 per cent.)—do not use water or methylated spirit.
- (10) Pour on fresh absolute alcohol, moving the slide from side to side as if developing a photo film. A third quantity of absolute alcohol may be required to complete the decolorization. On no account must decolorizing be carried on for longer than one minute.
- (11) Rinse with a few drops of absolute alcohol, follow immediately, without washing in water, by a solution of neutral red (neutral red, 1 gm., 1 per cent. glacial acetic acid, 2 c.c., distilled water, 1,000 c.c.). Let this act for half to one minute.

Note.—Even better results are obtained with carbol fuchsin, 1 in 10, as a counterstain—made up as follows : basic fuchsin, 1 gm. ; absolute alcohol, 10 c.c. ; acid carbol liq., 100 c.c. Dilute to 1 in 10 with distilled water before use, as the diluted stain does not keep.

- (12) Wash with water and dry with blotting paper.

The limitations of Gram's stain in relationship to the diagnosis of gonorrhœa should be noted :

- (1) That Gram-positive organisms, when taken up and digested by leucocytes, may lose their Gram-positive character.
- (2) That in cases of chronic gonorrhœa in which the material is such that a satisfactory film is difficult to obtain and in which the patient's body fluids tend to acidity, organisms determined by culture to be gonococci retain the violet stain with unusual obstinacy and appear to be Gram-positive.
- (3) That the stain does not distinguish between gonococci and other Gram-negative diplococci, such as *Micrococcus catarrhalis*, which may be present in both male and female genito-urinary tracts.

These limitations do not seriously affect the diagnosis in active acute cases of the disease.

62. Conditions associated with or simulating Gonorrhœa.

URETHRITIS SIMPLEX.—A non-specific urethritis may occur apart from gonorrhœa; it is much more common in the male than in the female and may be due to infection by *Micrococcus catarrhalis*, *Bacillus coli*, *streptococcus*, *staphylococcus*, *diphtheroids*, *Bacillus coryza segmentosa*, etc. An interesting case is on record of an infection by a fungus—*Aspergillus niger*—giving an inky black urethral discharge.

The use of too strong antiseptics, either in the form of irrigations or medicated bougies, may set up an inflammation and start a simple urethritis. It is stated that, if the female is menstruating at the time of connection, a urethritis is likely to be set up in the male partner.

Symptoms and signs.—The incubation period between sexual connection and the onset of a simple urethritis is, as a rule, longer than is the case with gonorrhœa. In simple urethritis it is between twenty-one and twenty-five days in most cases.

The symptoms and signs are similar to those seen in gonorrhœa, but the inflammatory reaction is not so severe. It rarely extends to the posterior urethra and the acute symptoms and pain disappear in twenty-four to forty-eight hours. The condition is, unfortunately, liable to chronicity in many cases and resistant to treatment.

Diagnosis.—Careful bacteriological examination of the discharge, repeated several times, is essential to make sure that the condition is not gonorrhœa. It must be remembered that a chronic gonorrhœa is often kept going by a secondary infection and that in such cases, the gonococcus is often very difficult to find. In some cases, moreover, a secondary urethritis may continue after the original gonorrhœa has been cured. In cases which are less acute, prostatorrhœa and spermatorrhœa may simulate a mild attack of urethritis. The possibility of the urethral discharge being due to an intraurethral chancre must not be overlooked.

Treatment.—The treatment is dependent on the etiology of the condition. If the discharge is due to trauma of the mucous membrane by irritating antiseptics or by instruments, it will subside quickly under the influence of an alkaline diuretic and hot sitz baths. Instrumentation and irrigation should, as a rule, be avoided, but in severe cases where there is much damage, irrigation with a dilute solution of lead acetate is very soothing.

In cases where pathogenic organisms are present, the same treatment may be adopted as in gonorrhœal infection of the anterior urethra. The best antiseptics for use in irrigation in these cases are: oxycyanide of mercury, 1/8,000, picric

acid, $\frac{1}{4}$ to $\frac{1}{2}$ per cent., perchloride of mercury, 1/30,000 to 1/20,000, boric acid, 5 grs. to the oz., and eusol, 0·5 per cent.

In association with severe illnesses, such as typhoid fever, measles, mumps and influenza, there may be a slight urethral discharge which is more serous than purulent in character. It is of relatively little importance and subsides when the primary illness is treated.

In all cases of simple urethritis due to infecting organisms mixed vaccine should be given.

63. Paraphimosis and Phimosis.—These conditions frequently arise from the inflammation caused by balanitis, chancres or gonorrhœa and should receive prompt treatment.

PHIMOSIS.—If the foreskin cannot be retracted after being bathed in hot lotions, and syringed under the tight edge, and if the discharge is still profuse, it should be opened up without delay either by a dorsal incision or, preferably, by the excision of a dorsal wedge. In the inflammatory stage, full circumcision should not be carried out; it should be performed later to correct any deformity that may remain. It is surprising, however, how seldom later circumcision is required, provided that a good-sized wedge of tissue has been removed.

64. Paraphimosis.—In this condition, the prepuce is retracted behind the glans penis and becomes restricted, so that it cannot be brought into its normal position. It may result from the retraction of a moderately phimotic prepuce during coitus; retraction of a prepuce rendered phimotic by inflammatory œdema. The orifice of the preputial sac acts as a constricting ring which lies in the coronal sulcus. It rapidly becomes œdematous and may ulcerate.

If the condition is recent and there is little œdema, reduction can usually be effected. The parts are cleansed and the glans is lubricated with liquid paraffin. The body of the penis is then grasped, behind the restricting ring, between the fore and middle fingers of both hands and strong traction applied; at the same time, steady pressure is applied to the glans with both thumbs. If there is much œdema, this can sometimes be reduced sufficiently to allow of reduction by applying warm, saturated magnesium sulphate over the œdematous area on a pad of lint and held in position by a rubber bandage tightly applied. The penis is supported in a vertical position for fifteen to thirty minutes. Surgical interference may be required.

65. Venereal Warts.—These have been spoken of as gonorrhœal warts, but this is not a correct diagnosis of their origin in all cases. The conditions which favour their growth are serous discharge, moisture and warmth. A smear of the pus shows many different organisms.

The inner surface of the prepuce, the coronal sulcus and the glans penis are the common sites in the male because these areas are kept sodden by the gonococcal discharge or an associated balanitis. In the female, the common sites are the anal orifice, the outer and inner surfaces of the vulva and vagina. These warty growths are painless and are simple papillomata.

Diagnosis.—Warts—condylomata acuminata—must be differentiated from condylomata lata, which are a manifestation of syphilitic infection. In warts, there is a definite pedicle, there is no induration round the base of the wart and the warty mass tends to assume a cauliflower formation. In condylomata lata, the growth is more in the nature of a hypertrophied papule with a firm, indurated base and a greyish flat top. Dark ground examination of serum expressed from the scarified edge of the papule will show *Treponema pallidum*—it must be remembered, however, that, in addition to the ordinary pathogenic organisms, many types of spirochætes, some of them morphologically very similar to the *T. pallidum*, are found in venereal warts. In condylomata lata, the Wassermann reaction is always strong positive.

Treatment.—The essence of treatment is dryness and any cause of moisture, such as gonorrhœal discharge, must be treated. If the warts are few in number and occur singly, they may be removed by tying a ligature round the pedicle, or by the application to each wart of a solution containing equal parts of strong tincture of perchloride of iron and liquor epispasticus. Care must be taken that the application does not touch the surrounding healthy tissue and this can be prevented by smearing it with vaseline. After treatment, the parts should be liberally dusted with powder—lycopodium acts admirably. After the warts have dropped off, which occurs in the course of twenty-four to forty-eight hours, recurrence may be prevented by dressing with Mill's paint—vinum ipecac., 1 part, Fowler's solution, 1 part, rectified spirit, 2 parts.

Where the growth is profuse and covering large areas, it is preferable to remove it under an anæsthetic. This may be done with a sharp spoon and any bleeding controlled with tincture of perchloride of iron or the actual cautery. A better and much less messy method is removal by surgical diathermy, where this is available.

In the healing stages, after operation, raw areas can be stimulated to granulate over by applying zinc sulphate in a strength of 2 grs. to the oz., or some other astringent lotion.

If phimosis is coexistent, the patient must be circumcised if a permanent cure is to be effected.

CHAPTER IV

SYPHILIS

66. Ætiology.—Syphilis is an infective disease due to a specific micro-organism—the *Treponema pallidum* (which is a microscopic thread-like spirillum)—infection taking place either by direct contact, most commonly in sexual intercourse, although other modes of infection are not unknown, such as touching infected articles or in the medical examination of infected patients; or the disease may be due to infected persons transmitting to their children, congenital syphilis.

Syphilis is well defined as being a contagious disease chronic in evolution, intermittent in manifestations and indefinite in duration, caused by a specific microbe.

The *T. pallidum* was discovered by Schaudin in 1905.

Syphilis is divided into three periods, though the tissue changes are essentially the same in all stages. This division into primary, secondary and tertiary is convenient for clinical and descriptive purposes.

67. Clinical Diagnosis.—*The importance of early diagnosis and treatment.*—In experimental syphilis in animals it has been found that castration within forty-eight hours after inoculation into the testis did not prevent a systemic infection and that within a week of such inoculation the blood of the inoculated animal was so heavily infected with *T. pallidum* that 0·5 c.c. was sufficient to transmit the disease to others. It would appear, therefore, that long before the appearance of even the primary sore, syphilis has become a systemic general infection. The importance and necessity, therefore, of attacking the *T. pallidum* at the very earliest possible moment after infection cannot be too strongly emphasized.

The earlier that this is done, the greater the probability of curing the disease. When the sore has become indurated, many of the infecting organisms are locked up in the sclerosed areas and are inaccessible to anti-syphilitic remedies circulating in the blood. Subsequently, as experience has shown, these treponemata may be released and reinfect the patient, the sore recurring, possibly with secondary symptoms. It is essential, therefore, to insist that men report sick on the first appearance of a sore, however trivial it may appear to be; and every endeavour must be made to diagnose syphilis by finding the *T. pallidum* before the blood gives a positive

Wassermann reaction, or the appearance of clinical signs of a later infection.

In every case of venereal sore the exudate must be examined for *T. pallidum* before any local treatment is applied and at the same time a specimen of blood will be taken for examination by the Wassermann test. If the first examination of the exudate is negative, examine on the two following days ; the sore in the meantime should be dressed with saline only.

If *T. pallidum* is not found and the Wassermann reaction is negative, the blood will be examined fortnightly by the Wassermann or allied test, or weekly if there is any suspicion that the case is one of syphilis, and syphilis will not be excluded until, at the end of three months, there are no clinical signs of disease and the Wassermann tests have given negative results. It must be clearly understood that the Wassermann reaction is generally negative during the first three, four or even six weeks after infection. During the above-mentioned period of investigation, the case can only be diagnosed "N.Y.D., V.S."

In cases in which the clinical diagnosis is undoubted, treatment must be begun at once, even if *T. pallidum* has not been found and the Wassermann reaction is negative ; but the blood for Wassermann test will be taken seven days after the first injection of arsenic.

It must be remembered that in a case of syphilis every day's delay in making a positive diagnosis lessens the patient's chances of a permanent cure, and may make all the difference to his ultimate fate. On the other hand, a premature exhibition of anti-syphilitic remedies before an accurate diagnosis has been made is as great a mistake as opium in an undiagnosed "abdomen" ; and a wrong diagnosis of syphilis involves the patient in at least two years of unnecessary treatment, moral condemnation and often mental depression, besides being a waste of time and money.

It is well known that the initial dose of arsenic often produces a phenomenon known as the "Jarisch-Herxheimer reaction." This consists in a "flare up" and may be disastrous ; an aneurism may burst, for instance. The focal reaction is usually more dangerous than the systemic and should be avoided where any delicate tissues are involved.

The blood shows this reaction in the "syphilitic content" of the serum. The increase is only registered by the Wassermann test after about seven days have elapsed, and is termed "the provocative effect," for a negative or doubtful reaction is usually provoked to a positive or strongly positive in syphilitic subjects.

The "provoked Wassermann reaction" has considerable

diagnostic utility. In the event of a "N.Y.D., V.S." case after a series of negative Wassermann tests showing a doubtful or weak positive reaction, the patient should be given a provocative dose of sulphostab at once (provided that there is no contra indication) and the blood be resubmitted for testing seven days later. If the result is negative, it suggests that the case is not syphilitic and that some clerical or laboratory error has been made in dealing with the previous specimen, and a recheck is necessary. If, however, the result is provoked to a positive or strong positive, the case is one of syphilis. No delay has been incurred by the checking of the readings, as the provocative injection has now become the first therapeutic one.

A word of warning, however, is necessary as regards the abuse of provocative injections. It has been the habit of some medical officers, when in doubt as to the diagnosis of a sore, to give an arsenical injection for a "provocative diagnosis," even at the first time of seeing the patient. This is a most reprehensible practice and very bad treatment. Suppose the patient is seen in what is known as the early primary stage of invasion, his diagnosis is doubtful, as the medical officer has been unable to find the *T. pallidum* at his first examination and the appearance of the sore gives no help. A provocative injection is given but the following Wassermann reaction is negative. The patient is told that he has soft sore and goes on his way rejoicing.

While the first dose of arsenic (*i.e.* the provocative one) is being absorbed, the body finds that there is no need for the production of anti-bodies to the *T. pallidum*, as the arsenic is killing them off. When the action of the arsenic ends, the unfortunate patient is left with a large infection (it is large compared with that at the time of appearance of his primary sore) by treponemata, against which he has no protection.

The Wassermann test should be employed and considered as an aid to clinical judgment, and not to replace clinical observation and knowledge; the actual diagnosis depends on accurate clinical observation and experience, combined with microscopical and biochemical results.

68. In recording results of blood tests the following degrees are recognized:

("8" = complete hæmolysis and "0" = no hæmolysis at all)

Wassermann	Kahn	Interpretation
Negative. 8/8.	0	Negative.
Negative incomplete. 0/8-4/8.	±	Doubtful.
Weak positive. 0/8.	+	Sufficient to diagnose an unknown case.
Positive. 0/4.	+ + or + + +	} Clear positive.
Strong positive. 0/0.	+ + + +	

69. Examination of the Patient.—The patient strips naked and stands in front of and facing the medical officer. The medical officer inspects generally the whole front of the body, then examines the penis and ascertains whether the case comes under the heading of “sores,” “late syphilis” or “discharge.” If the former, then the sore is closely examined, the medical officer at the same time dictating notes on the case to his clerk, who fills up A.F. I 1247 as the notes are dictated and the examination proceeds.

The medical officer may then take a smear from the exudate of the sore (*see below*) and examine it at once, if the dark ground method is in use, or he may leave it to the end of the examination of the patient. Having finished with the sore he examines the inguinal glands, those at the root of the penis and the penile lymphatics, then the epitrochlear, axillary, cervical and submaxillary glands. He then inspects the skin of the whole anterior aspect of the body from head to foot, then takes hold of one hand of the patient, turns him round to that side and inspects the hand, arm and that lateral aspect of the trunk and lower limb. He then turns the patient round and inspects the back, back of the thighs and legs and soles of the feet. The patient is then directed to separate his legs widely and to stoop down and touch the floor with his fingers; the medical officer separates the buttocks and inspects the whole perineum and anal region, after which he pulls back the scrotum, stretching out its surface as he does so, and inspects the posterior aspect.

The patient then stands up and turns round to have the other side examined. The mouth is then examined with the aid of a glass spatula as follows: first the mucous membrane between the cheeks and teeth on one side, then on the other, then the gums, including the teeth; the medical officer next directs the patient to put his tongue on the side opposite to that in which he holds the spatula—this gives a good lateral view of the tongue—he next reverses this proceeding on the other side. The patient is now told to turn his tongue up so that the under surface can be inspected. After this, the tongue is depressed and the tonsils, pharynx and the whole of the palate are thoroughly examined. The patient is told to turn down his lower lip with his fingers, then the upper lip upwards; this completes the examination of the mouth.

The eyes are then examined and tested for their reaction to light and accommodation. The knee, ankle and wrist reflexes are then tested. This completes the physical examination, unless signs of involvement of the nervous system have been observed, when complete examination of this should be carried out.

During this examination, which with a little practice can be carried out in five minutes, the medical officer asks such questions as he thinks necessary—any deafness, headaches, etc.

Having completed the examination the medical officer sums up mentally the evidence for and against syphilis; he then asks the history of the sore from the patient, not forgetting to get the dates of the last three exposures to infection with their localities. It should be remembered that venereal patients are not always truthful in their statements and considerable tact and patience are often required in eliciting the truth.

The medical officer should also inquire as to the use of the preventive treatment room and preventive packets and induce the patient to detail exactly how he has used these, so as to ascertain if such prophylaxis has been correctly employed.

70. Symptomatology.—*The primary stage.*—This consists in the development of the primary sore or chancre at the point of inoculation, followed shortly afterwards by the enlargement of the corresponding lymphatic glands. A certain time elapses between the inoculation and the appearance of the primary chancre; this incubation period is usually between three to four weeks, average time 25 days.

The secondary stage.—After a second incubation period of about seven weeks (that is seven weeks after the appearance of the chancre) the secondary period begins, during which symptoms of general infection are manifested. After the secondary symptoms have subsided a latent period occurs during which the treponemata are, apparently, inactive but liable to renew activity at indefinite periods. The duration of the secondary period in an untreated case is usually reckoned as at two to three years, but may be much longer.

The tertiary stage.—There is no definite line of demarcation between the secondary and tertiary stages.

71. Primary Syphilis.—The chancre always develops at the point of inoculation and is usually single. This latter characteristic is, however, not universal, for in about 20 per cent. of cases it is multiple. Multiple chancres are caused by several places in the skin being inoculated at the same time. The chancre is highly contagious and *T. pallidum* may be found in scrapings from the surface and in sections.

There are different types of primary chancre and the following classification is convenient:

(1) *Hunterian chancre.*—Marked induration causing a cartilaginous feel to the fingers. It is usually found on the inner surface of the prepuce.

(2) *Primary granulating chancre*.—This is usually found on the shaft of the penis, the scrotum or thigh. It is a round or oval ulcer which looks as if it had been painted on. In the oval form the long axis lies across the shaft of the penis. There is very little induration, the edges are flush, there is no infiltration round and the healthy skin comes right up to the edge of the sore. The ulcer is regular in outline, it is shallow and covered with fine granulations with a glazed appearance. It is typical of syphilis and, when it heals, leaves a characteristic scar, a whitish area with surrounding pigmentation, which is permanent and pathognomonic of syphilis. This type of sore is often associated with the characteristic, non-inflammatory œdema of syphilis.

(3) *Abrasive chancre*.—This is commonest on the glans penis as a small, sharply defined abrasion of the mucous membrane. It generally heals quickly without leaving a scar and is easily missed.

(4) *Papular chancre*.—This is a rare form and occurs as an indurated, raised papule about the diameter of a lead pencil, usually on the inner surface of the prepuce.

(5) *Papulo-erosive chancre*.—This is a further stage in the papular chancre in which the surface has become eroded. It is probably the most common form of sore and is most frequently seen on the inner side of the prepuce or on the frænum. It has a surrounding induration but no inflammation.

(6) *Ulcerative chancre*.—This is a later stage of the papulo-erosive chancre in which it has become secondarily infected and ulcerated. It may be painful and inflamed.

(7) *Phagedenic chancre*.—This is usually situated in the coronal sulcus and occurs as a deep, punched-out ulcer.

(8) *Meatal and urethral chancres*.—Serous discharge from the meatus and marked induration felt in the urethra, which is usually unilateral, characterize these types.

(9) *Concealed chancre*.—A syphilitic chancre may be concealed behind a phimosed prepuce which cannot be retracted; palpation usually reveals the unmistakable induration, but this is not always so; the feeling of induration may be given by a concealed soft sore or inflamed penile lymphatics. It is in the case of phimosis with concealed sores that phagedena is most apt to occur and one must be on the watch for this complication, as it spreads rapidly and may cause great destruction in a short time. Phagedena may be suspected by the acuteness of the swelling, the commencing local lividity of the skin, the tenderness and the character of the discharge. It will need immediate operation.

(10) *Extragenital chancre*.—This type, as its name suggests, occurs on some part of the body other than the genital organs. The most common situations are: the lip, the tongue, the tonsil, the finger, etc. They are generally single and are associated with unilateral enlargement of the neighbouring lymphatic glands. The character of the chancre depends on the site; thus, those on the skin always assume the “granulating” type; chancres of the lip, tongue or tonsil are usually of the papulo-erosive or ulcerative type.

(11) *Recurrent or redux chancre*.—A healed primary sore may break down at any time after it has healed. If this occurs during or shortly after treatment, it is usually a recurrent or redux chancre. Such chancres occur at the site of the original, or in the adjacent lymphatic drainage area. They contain *T. pallidum* in fair abundance, usually have an associated adenopathy and the Wassermann reaction may be either positive or negative. These recurrent chancres are thought to be due to the awakening of hibernating *T. pallidum* which have dug themselves in behind old syphilitic, sclerosed tissue.

Pseudo-chancre redux, on the other hand, is a gummatous recurrence at the site of the original chancre in which it is practically impossible to find *T. pallidum* and which is not usually associated with any adenitis. The differential diagnosis between a chancre redux, a fresh infection and a broken-down gumma is often one of very great difficulty.

In their earlier stages primary syphilitic sores and chancroids (soft sores) are so alike that it is impossible to determine their true nature by inspection alone.

Some types of primary chancre are never hard; multiplicity, as stated above, is fairly common. “Shotty glands” can be felt in the groins of almost every athletic man. Typical syphilitic glands are definitely large and “rubbery” in consistence. On the other hand, many chancroids are single and show considerable induration, which is often harder than that found in primaries. It is claimed, however, that the induration of the chancroid is more limited to the sore than that of the primary. To add to these difficulties a mixed syphilitic and chancroid infection is by no means uncommon, so that typical chancroid may, later, assume primary syphilitic characteristics.

A syphilitic chancre commences as a dull red papule. As it increases in size it becomes indurated. The surface may be eroded, or there may be some necrosis of the covering epithelium, which then forms a brownish crust. When this is removed, it leaves a shallow erosion. If secondary infection is added ulceration takes place. The eroded or slightly

ulcerated stage is the earliest one seen in soldiers and macroscopically it is impossible to distinguish from the early soft chancre.

The syphilitic sore is evenly round or oval, well embedded in the tissues, *i.e.* both inner and outer edges slope gradually down, the base of the ulcer when formed is usually above the level of the surrounding skin, the colour is pinkish or brownish-red rather than bright red, with a pinkish-red areolar round it instead of a sharply defined red line immediately round the erosion. When induration is present it extends beyond the edges of the sore, whereas in soft sores it is usually limited to the sore itself.

On the glans penis and on the mucous membranes this induration is not so definite a characteristic as on the skin or muco-cutaneous junction. A chancre is usually painless and does not bleed easily. Neighbouring glands are enlarged to about the size of small nuts, rubbery in consistence, painless, discrete and freely movable, while the overlying skin is unaltered.

These points have been somewhat laboured not to confuse, but to emphasize, the dictum that in no case is a medical officer justified in regarding a sore as non-syphilitic from the appearance alone. The appearance of the sore and the absence of *T. pallidum* in the exudate may lead him to suspect chancroid, but syphilis can only be excluded by the Wassermann reaction.

72. Secondary Syphilis.—The secondary stage of syphilis is a systemic infection like the specific fevers. Like them, too, it is recognized by its characteristic rash.

The following general manifestations are present in varying intensity. They are not usually very marked and in robust subjects may be absent altogether.

(1) *Headache*.—Worse at night.

(2) *Pyrexia*.—The temperature may be up to 100° F. at night.

(3) *Malaise*.—Amounting to a mild disturbance of digestion with loss of appetite, a muddy complexion and a relative anæmia.

(4) *Sore throat and mouth*.—These follow and at the same time or later the characteristic rash develops. There may be mucus patches, but the average early throat is not ulcerative but catarrhal.

(5) *The glands* throughout the whole body are enlarged and, owing to the early involvement of the naso-pharynx, the posterior cervical and occipital ones are enlarged early.

(6) Other secondary syphilitic manifestations are neuralgic pains, nocturnal pains in the bones (due to periostitis), teno-synovitis and synovitis.

(7) More severe secondary symptoms are iritis, arteritis—causing early cerebral and spinal syphilis—nephritis and otitis—unilateral or bilateral deafness.

73. Tertiary Syphilis.—This will be discussed under the various regions of the body.

74. Regional Syphilis.

THE SKIN.—The following changes occur in the skin and its appendages and mucous membranes :

Syphilides, or syphilitic rashes. These may be distinguished by their coppery or raw ham colour, more or less surrounding pigmentation, symmetrical arrangement, circular or crescentic shape, absence of scales, predilection for certain situations, *i.e.* chest and abdomen, between the shoulders, back of the neck, forehead, palms of hands and soles of feet and the flexor aspect of the limbs, and their polymorphism—that is, there may be different types of rash present at the same time.

Syphilitic rashes having the characters of the secondary period may occur in what is usually regarded as a tertiary period (as late as ten years or more after the chancre). The most important of these later syphilides are :

- (1) Palmar and plantar syphilides.
- (2) Recurrent roseolar syphilides.
- (3) Mucous syphilides of the mouth and genital organs.
- (4) Tertiary erythema.
- (5) Glossitis.

Syphilides may be classed as under :

(a) Erythematous syphilides.

(1) *Roseolar.*—This is nearly always the first eruption to appear—usually about the seventh week after the start of the chancre in untreated cases. It first appears on the flanks, abdomen and chest, less commonly on the limbs and rarely on the face. It consists of regular, rose-red spots, discrete or confluent and not raised above the surface of the skin ; there is no itching, no scaling and no desquamation. The rash may only last a few days (even without treatment) or may persist much longer (even with treatment).

(2) *Recurrent roseolar.*—This rash may occur several times during the course of the disease and generally consists of a more discrete eruption, the spots being fewer, paler and larger.

(3) *Tertiary erythema.*

(4) *Pigmentary syphilide.*—This is seen chiefly on the sides and back of the neck. It consists of greyish-brown pigmentation that forms a sort of network enclosing areas of normal skin. It has been called the “Collar of Venus.” It is a persistent syphilide and does not disappear rapidly with treatment. It may occur, but more rarely, in the axilla, on the thigh and on the trunk. It is more common in women than in men.

(b) *Papular syphilides.*(1) *Simple papular.*(2) *Papulo-squamous.*

(3) *Papulo-erosive*—includes mucous patches and condylomata.

(4) *Papulo-vesicular.*(5) *Papulo-pustular*—rupia.(6) *Papulo-ulcerative.*(7) *Papulo-bullous.*

The papular rashes generally appear about the third month, but they may come out with the roseolar or even precede it. The distribution is more general than the roseolar; it often affects the forehead near the hairy margin—“Corona Veneris.” The papule is a flat, raised, round, ham-coloured lesion, usually less than the size of a pea but sometimes larger.

When papules occur on moist surfaces, as round the mouth and anus, or in the folds of the skin in fat subjects, the infiltrated surface undergoes maceration and the resulting blue-grey lesions are called condylomata. In unclean subjects they may become very large and assume an extensive warty appearance.

The maculo-papular rash is the commonest.

(c) *Gummatous syphilides.*(1) *Cutaneous gummata.*(2) *Subcutaneous gummata.*

Gummata, which occur in the tertiary period of the disease at any time, consist of dark red nodules of slow evolution; the nodules may be separate or they may be close together forming a *serpiginous syphilide*.

Ulcerative gummatous syphilide consists of a single nodule or a number of nodules which break down into ulcers which are painless and may cause great destruction of tissue if not treated. They heal rapidly under treatment.

Gummatous ulcers are usually circular in shape, or when several ulcers are joined together, serpiginous. The borders of the ulcer are well defined, vertical and sharp cut; they are

deeply excavated. The edges of the ulcer are adherent and not undermined ; they may occur on any part of the body.

Alopecia.—Loss of hair is usually associated with the macular rash and is perhaps due to the presence of the macule. The hair comes away intact without broken stumps in patches about the size of a macule and it presents a moth-eaten appearance which has been likened to “glades in a forest.”

Atypical lesions of the skin.—Syphilitic lesions are modified by general and local causes and not for nothing has the disease been called “the great imitator.” In tuberculous subjects the rash is often severe, the two infections apparently helping each other.

The following lesions are to be distinguished from secondary syphilis :

On the face.—Bromide or iodide rash, impetigo, acne rosacea, acne varioliformis, seborrhœa.

On the neck.—Pigmentary conditions of the skin.

On the trunk and limbs.—Pityriasis rosea, psoriasis, urticaria, seborrhœa, lichen planus, toxic erythemata, scabies, drug rashes—copaiba, mercury, iodides, bromides, arsenic, etc.

On the palms and soles.—Psoriasis, lichen planus, arsenical dermatitis.

75. The Circulatory System.—Syphilis may produce chronic lesions of the heart, gummatous endocarditis, fibrous endocarditis, etc., and may be regarded as one of the chief causes of heart disease next to rheumatism.

Syphilitic arteritis.—This is an infiltration and thickening of all the coats of the arteries or what is called an endoperiarteritis. Any of the arteries of the body may be affected ; for example, there may be syphilitic arteritis of the cerebral vessels, causing various types of nervous symptoms (this may occur in the first year of the disease) ; or the large vessels, like the aorta, may be affected, leading to aneurism (this occurs much later in the disease—fifteen or twenty years after infection). Lesions of the first part of the aorta are always syphilitic and aortic regurgitation is commonly caused by syphilis. Angina pectoris is another result of syphilitic disease of the aorta and coronary arteries.

76. The Alimentary System.—Erythema of the throat and mouth is an early secondary symptom of syphilis.

Mucous patches.—This is a papulo-erosive syphilide occurring on the mucous membrane of the mouth and throat ; most commonly seen on the tonsils, lip and tongue—rarely on the pharynx. Mucous patches are very contagious—the

most contagious of all syphilitic lesions. A string of mucous patches produces a characteristic "snail tract" ulcer.

Secondary infection of the lips, tongue and tonsils has to be diagnosed from stomatitis (mercurial or due to bismuth, etc.), herpes, dental ulcer, impetigo of the lips, Vincent's angina and diphtheria.

Tertiary syphilides occur as under :

(1) *The lips*.—Diffuse hypertrophic syphiloma of the lip is a general boggy infiltration of the whole of one lip. Gumma is rare and occurs as a hard circumscribed lump in the substance of the lip.

Note.—It may be mistaken for cancer. If the gumma ulcerates, it may be mistaken for primary chancre of the lip, but there is no glandular enlargement in the case of gumma.

(2) *The tongue*.

(a) *Sclerosing glossitis*.—This may be superficial or deep and is an indurated, lobulated condition of the tongue produced by cicatricial contraction of fibrous tissue. The fissures between the lobules form a network. The mucous membrane is deep red in places and pale in others, smooth, tense and without papillæ. The process first causes enlargement of the tongue, which may attain a large size—*syphilitic macroglossitis*—later the tongue shrinks from contraction of the fibrous tissue in the tongue substance.

(b) *Gummatous glossitis*.—This may also be superficial or deep. Superficial gumma causes ulceration of the mucous membrane.

(c) *Leucoplakia*.—This occurs as bluish-white patches due to thickening of the mucous membrane—the surface of the tongue is usually smooth but is sometimes rough. It usually affects the dorsum of the tongue, sometimes the sides, but rarely the under surface. The condition is almost always due to syphilis. It may, and frequently does, occur on other mucous surfaces such as the inner sides of the cheeks, the vulva and vagina, etc. This condition must be distinguished from aphthæ, lupus and lichen planus.

(3) *The palate*.—The hard and soft palates are favourable sites for tertiary syphilides in the form of gummatous ulcers. The gumma may affect the hard or soft palate. The ulcer is round or irregular in shape, varying in depth and size, has a yellowish or grey base and a red areolar. The ulcerative process may be very rapid in progress causing destruction of tissue and perhaps perforation of the palate. A common site for this rapid perforatory ulceration is at the junction of the hard and soft palates.

Note.—There may be no fundamental symptoms and with this ulceration the patient may not complain of any pain (absence of pain is a characteristic of all syphilitic lesions).

These gummatous lesions rapidly heal with treatment but, of course, if perforation has occurred permanent deformity remains.

(4) *The tonsils.*—Gummatous ulceration is generally unilateral and may be complicated by acute angina. It has to be diagnosed from primary chancre, with which there is marked swelling of the submaxillary glands; cancer, which is slower in progress, is more indurated and more painful (usually in the ear). In cancer also there is early glandular infection. Tubercular disease of the tonsil is usually secondary to disease of the lung and/or larynx, and ulcerative tonsillitis forms a grey ulceration with caseous matter which is easily removed.

(5) *The pharynx.*—Tertiary gummatous lesions of the pharynx are less common than those of the palate and tongue. Gummatous ulceration, when it does occur, usually affects the posterior wall.

(6) *The naso-pharynx.*—Gummatous ulceration may be visible only by posterior rhinoscopy, or it may be seen by pushing up the soft palate. If not diagnosed, it may lead to ulcerative destruction of the Eustachian tubes causing deafness.

Tertiary syphilis may, of course, affect the tongue, palate, pharynx, etc., at the same time.

(7) *The liver.*—Syphilitic lesions of the liver are gummata, amyloid disease (which is secondary to the chronic infection), acute yellow atrophy, interstitial hepatitis.

77. The Respiratory System.

(1) *The nose.*—(a) The primary chancre may, though very rarely, occur in the nostrils or in the nasal cavity.

(b) Secondary syphilides. Erythema and papular rhinitis—mucous patches are rare.

(c) Tertiary syphilides consist of gummata with ulceration and necrosis causing scars and adhesions.

Gummata may occur in the nasal septum or in the inferior turbinate body; perforation of the septum may occur. The symptoms of tertiary ulceration of the nasal cavity are a foul-smelling nasal discharge with perhaps blood-stained pus and necrotic tissue. This ulceration may cause much destruction within the nasal cavity with little external deformity, or it may cause both. "Saddle back" nose is caused by destruction of the nasal bones—this is a more common deformity in congenital syphilis.

(2) *The larynx*.—Secondary syphilis may cause erythema of the larynx ; mucous patches may occur in the epiglottis or on the vocal chords. Syphilis may cause a persistent catarrhal laryngitis. Tertiary manifestations are gummata with later ulceration and cicatricial contraction. The ulceration sometimes causes rapid destruction of the framework of the larynx.

Symptoms of tertiary syphilitic disease of the larynx are faint and raucous voice, fœtid, mucopurulent (occasionally blood-stained) discharge. Pain is generally absent.

(3) *The lungs*.—Fibrositis and gummata. Usually both occur together.

Gummata are generally limited to one lobe of the lung and always develop in fibrosed tissue. The symptoms of syphilitic fibrosis and gumma of the lung closely resemble the symptoms of phthisis.

78. The Genito-urinary System.

(1) *The external genital organs*.—Papulo-erosive syphilides or mucous patches may occur on the inner surface of the prepuce or in the balano-perputial furrow. Papular syphilides and condylomata may occur on the scrotum and skin of the penis. Syphilides of the scrotum tend to become eczematous.

Note.—Mucous syphilides on the penis which have undergone secondary induration may be mistaken for primary chancre but differ in the absence of inguinal adenitis.

Genital syphilides are very infectious.

Syphilides of the external genitals may be diagnosed from soft chancre, traumatic abrasions, psoriasis, scabies, herpes and diabetic eruptions.

In this situation gummata of the penis are more common than is generally supposed and are often situated on the same place as the former chancre ; they may be mistaken for chancre—especially when ulcerated. With gumma there is absence of adenitis in the groin and, when ulcerated, the penis may become phagedenic.

(2) *The epididymis*.—Syphilitic epididymitis generally appears in the third or fifth month of secondary syphilis ; it is confined to the upper part of the organ, is usually unilateral, often painless and less acute than the gonorrhœal variety.

(3) *The testicles*.—Syphilitic orchitis may occur during the tertiary period—seldom before the third year—and may assume the form of interstitial or gummatous orchitis.

Interstitial orchitis is a chronic, insidious interstitial fibrosis affecting the whole of the connective tissue of one or both testicles. The testicle is uniformly enlarged ; the epididymis and cord are usually unaffected as is also the skin of the

scrotum. Hydrocele is generally present ; there is no pain or tenderness and testicular sensation is usually lost. If the condition is left untreated it leads to fibrous atrophy of the testicle.

Gummatous orchitis is a more advanced degree of interstitial orchitis with circumscribed gummata.

(4) *The kidneys*.—Early in the infection an acute or sub-acute nephritis may give rise to transient attacks of albuminuria. The condition may be a toxic one, while in other cases there is an actual invasion of the kidney by spirochætes. In later syphilis a chronic infiltration of the renal tissue may give rise to chronic interstitial and parenchymatous nephritis. In other cases single or multiple gummata may be found either in the cortex or the medulla of the kidney. In syphilitic disease of the kidney, more than in any other condition, very large quantities of albumin are found in the urine.

79. The Eye and its Appendages.—The eye may be attacked by any stage of the disease or it may be diseased by congenital syphilis.

(1) *Ocular chancre*.—This is exceedingly rare and, when it occurs, it appears as a small papulo-erosive chancre on the margin of the eyelid, generally near the inner canthus.

(2) *Keratitis*.—This is very rare in acquired syphilis but is most common in the congenital form of the disease.

(3) *Iritis*.—Inflammation of the iris is rare in syphilis.

(4) Tertiary lesions are gummata of the eye, motor affections, paralysis of the muscles of the eye, sensory lesions, neuralgia of the fifth nerve, etc.

80. The Bones.

(1) *Periostitis*.—This appears chiefly in the ribs, frontal bone, tibia, sternum and clavicle. The symptoms are local swelling and tenderness on pressure and are worse at night.

(2) *Ostalgie*.—Pain without thickening of the periosteum. The pain is situated chiefly at the ends of the long bones and points of attachments of tendons and ligaments.

(3) *Osteo-periostitis*.—This occurs in late secondary or tertiary syphilis and affects chiefly the tibia, clavicle, sternum and skull. This process usually occurs in localized areas and thus produces a condition called nodes.

81. The Joints.—The joints may be affected in both secondary and tertiary syphilis.

(1) *Arthralgia*.—Pain in the joints on movement and swelling of the joint may occur during the first month of the disease. The pain quickly disappears under treatment.

(2) *Hydrarthrosis*.—This is an effusion into the joint without any inflammation. The knee is the joint usually affected. This condition is more common in late congenital than in acquired syphilis.

(3) *Gummatous arthritis*.—This is the most common form of syphilitic arthritis and generally affects the knee joint. There is an effusion into the joint, insidious in onset. If the condition is neglected ankylosis of the joint may occur.

82. The Nervous System.—Syphilis may affect the nervous system in two ways :

(1) A specific inflammation of the interstitial tissues involving principally the membranes and blood vessels, occurring rather early in the disease. This type of reaction to the invasion of the spirochæte is called cerebral or cerebro-spinal syphilis.

(a) *Syphilitic meningitis*.—This commonly affects the base of the brain and may extend down the membranes of the cord. The parts affected are those where the cerebrospinal fluid is most abundant. Gummata always originate in the meninges and, when they occur in the substance of the nervous tissue, it is really a gummatous development in the meningeal extensions which follow the blood vessels into the nerve tissue.

Larger gummata may develop in any part of the brain but occur more commonly at the base near the optic chiasma. A circumscribed gumma may develop in the dura mater at the site of an injury or blow and is more amenable to treatment than the more generalized form.

(b) *Syphilitic cerebral arteritis*.—This is the chief cause of cerebral syphilides and is most often found in the vessels forming the circle of Willis and especially the middle cerebral artery.

By narrowing of the vessels it causes anæmia and sometimes complete blockage of the lumen leads to softening of the corresponding part of the brain. It chiefly affects the origin of the terminal arteries.

The symptoms produced by syphilitic cerebral arteritis vary greatly, depending on the site of the lesion, *e.g.* epileptic attacks—epilepsy appearing for the first time after thirty is very frequently due to syphilis ; various forms of paralysis of the ocular muscles—especially the third nerve ; optic neuritis, hemiplegia, usually due to endarteritis and thrombosis of the middle cerebral artery ; headache, sudden loss of memory, etc. The condition may terminate in complete recovery, incomplete recovery, permanent disablement, blindness (on both sides), deafness (on one side), death.

(2) A degeneration of the nerve tissue proper, parenchymatous in nature. This type of reaction produces a so-called *parasyphilitic* condition.

(a) *General paralysis of the insane*.—In this condition there is widespread degeneration of the nerve cells and cerebral hæmorrhages. The great majority of general paralytics are men. Symptoms begin from six to twelve years after infection and the onset is insidious. The higher centres go first, causing very slow mental and moral deterioration; at this stage the only indication is a change in the character of the individual which is only noticeable by those intimately connected with him. Grandiose delusions of wealth and power and business acumen follow and lead the patient into foolish business ventures, etc. This stage may last a year or two and then a stage of depression sets in. He neglects his personal appearance, loses his self-control and frequently becomes addicted to vices such as alcoholism.

Tremors, slurring speech, slight facial palsy may occur. True Argyll-Robertson pupils may be present—unequal and reacting to accommodation but not to light—but more often they are seen to be contracted and there is only sluggish reaction to light. Knee jerks may be exaggerated. In the third or fourth year speech and swallowing are affected, paralysis and convulsions from cerebral hæmorrhages appear. The patient does not often survive the fifth year after but may drag on for ten or fifteen years.

(b) *Tabes dorsalis (locomotor ataxia)*.—There is degeneration of the posterior columns of the cord and the posterior nerve roots; it almost always occurs in men. It arises at any time from the fourth to the twentieth year. There is loss of power in the legs, numbness in the feet, girdle (compression) pains in the trunk, darting (lightning) pains in the legs, difficulty in micturition and unsteady gait. The Argyll-Robertson pupil develops usually before the loss of knee jerks and the Babinski's sign. There is general inco-ordination of movement and loss of muscle sense, so that the patient with his eyes shut cannot readily carry the index finger of an outstretched arm to the tip of the nose, or say whether his big toe is bent up or down or stand steadily with his heels together (Rhomberg's sign).

Tabetic crises may develop; gastric, in which there is severe abdominal pain, is the commonest; less commonly, rectal, vesical or laryngeal may arise. Painless disorganization of the joints (Charcot's joints) and perforating ulcers of the feet result from disturbance of the trophic mechanism. Optic atrophy leading to complete loss of vision may develop.

(c) *Tabo-paresis*.—In this condition there is a simultaneous affection of the brain and cord; consequently the clinical picture is similar to that of general paralysis with symptoms and signs of tabes added.

The symptoms and signs in neuro-syphilis are very variable and depend largely on which part of the nervous system is attacked. It is important, therefore, to be on the look-out for slight early symptoms, especially those of an irritant nature.

83. Congenital or Inherited Syphilis.—An infant may acquire syphilis during the passage through infected maternal passages or be infected immediately after birth, but the majority of cases are truly congenital, *i.e.* they have inherited (acquired *in utero*) and it is now believed that the infection is generally a transplacental one.

In congenital syphilis there is no primary sore. It begins as a generalized infection and the effects may conveniently be classified as follows. It must, however, be remembered that the clinical picture is as variable as that of the acquired type.

(1) *Toxic or dystrophic effects.*—These include congenital malformations, arrests of development, general toxic effects, etc., infantilism, dwarfism, gigantism, cretinism, etc. Late development of speech and walking and maldevelopment of the permanent teeth have also been ascribed to the disease.

(2) *Manifestations of active syphilis.*

(a) *Fœtal syphilis and syphilis in the newborn.*—This condition usually causes the death of the fœtus, which is frequently macerated and has every organ teeming with spirochætes. The newly born syphilitic infant is a small, wizened, puny, weakly creature like a monkey or an old man. The skin is often flabby, wrinkled and putty coloured. Plantar and palmar squamous or bullous skin lesions may be present.

(b) *Infantile syphilis.*—In this case the infant shows no visible signs of syphilis at birth and many even appear plump and healthy. The child, however, loses twice as much weight as normal and takes weeks to regain it. In spite of careful attention, it goes on losing weight but may respond readily to mercurial treatment.

Occasionally, apart from grooving of the nails and thinning of the hair, no cutaneous lesions develop, but the child goes slowly downhill and dies.

Generally mucous and cutaneous lesions occur during the first few weeks so that it presents the typical appearance with a rash, a nasal discharge and perhaps a hoarse cry.

Macular rash.—This is usually darker than in the acquired disease; similar lesions cause thickening of the mucous membranes resulting in “snuffles,” muco-purulent and blood-stained nasal discharge, hoarse cry, etc. The development of the nasal bones may be permanently prevented or the bones necrosed. Inflammation of the middle ear may occur.

Papular rash.—This is a further stage. The lesions usually appear on the buttocks, palms and soles, forehead and round the mouth. Those round the mouth, on healing, leave linear scars—rhagades. The hair may fall in patches and there may be suppuration round the nails—perionychia.

Bone lesions.—Epiphysitis—inflammation of the epiphyses resulting in the formation of fibrous tissue instead of bone—results in separation of the epiphyses and consequent immobility of the limb—pseudo-paralysis. The joints may become affected, resulting in arthritis. In the short bones of the hands swellings may be produced by these changes—syphilitic dactylitis. In the flat membranous bones of the skull, the process results in overgrowth—Parrot's nodes—or defective growth—craniotabes.

Visceral lesions.—Interstitial fibrosis may occur in the liver, spleen, testes, etc.

(c) *Delayed inherited syphilis.*—This appears about the twelfth year. It may be either earlier or delayed. It is evidenced by arrested development of the organs of the body generally, lesions of a tertiary nature, parasyphilis.

Arrested development.—This may be local, *e.g.* teeth, or more widespread, *e.g.* brain, thyroid, testes, etc.

Lesions of a tertiary nature.—The typical patient is stunted in growth and muddy in complexion, has a saddlebacked nose, a square, natiform or hot-cross bun skull and notched teeth.

Hutchinson's teeth—"peg-top" tapering of the upper central incisors with notching of the free edge. *Moon's teeth*—domed formation of the cusps of the first permanent premolars—interstitial keratitis, deafness, "sabre blade" tibiae, atrophy or enlargement of the testes, cicatrices on the buttocks and round the mouth, all tend to stamp the condition.

Anæmia may be marked and the liver and spleen enlarged. The delayed lesions of inherited syphilis conform to the tertiary type of gummata and interstitial fibrosis.

Parasyphilis.—Juvenile general paralysis and tabes are met with but are not common.

84. Laboratory Tests for Syphilis.—In view of the multiplicity of symptoms and signs and in consequence of the imitative nature of the disease, laboratory tests are of the utmost importance in syphilis. At the same time, it must be remembered that, because a patient has a positive Wassermann reaction, it does not necessarily follow that all the symptoms of which he complains are syphilitic in origin. Furthermore, an early diagnosis is essential if satisfactory results are to be obtained from treatment.

Two main methods of positive diagnosis are available—the finding of the causative organism in the lesions and the estimation of changes set up in the body fluid by the disease.

85. Detection of *Treponema Pallidum*.

(a) *Directions for taking specimens*.—The skin, mucous membranes, genitals and mouth usually swarm with non-pathogenic spirochætes. In taking slides from these areas, it is very difficult to ensure that the exudate comes only from the deeper portions of the sore and is not contaminated with neighbouring surface secretions.

In cases in which an antiseptic or a local anæsthetic has been applied to the sore, it may be impossible to discover the *T. pallidum* unless a wet dressing of normal saline solution is applied to the sore for three or four days before the specimen is taken.

(i) Thoroughly cleanse the sore and its surroundings with a swab of cotton wool or lint moistened with a 2 per cent. saline.

(ii) Scrape the margin of the sore lightly with a blunt instrument to remove the superficial epithelium, and then squeeze its base so as to promote a flow of serous fluid. Slight bleeding will probably occur but will soon cease. In a minute or two clear serum will exude from the scarified area. Make films of this clear serum, cover with a cover-slip and ring with vaseline to prevent currents due to evaporation.

The serum should be examined as soon as possible to get the best results.

(iii) If no local facilities exist for microscopical examination, fill a glass capillary tube with the serum to the extent of $\frac{1}{2}$ to 1 in., seal it and send it off for examination and report.

(iv) Gland puncture is of great value. Adenitis is generally apparent some weeks before the Wassermann reaction is positive and the recognition of the *T. pallidum* from gland secretion is much easier than in serum from a sore.

To obtain the secretion from a gland, a 1 c.c. syringe with good suction should be selected. Paint the skin with iodine, steady the gland with the fingers and thumb of one hand and inject into the gland 2 to 3 minims of sterile normal saline through a wide-bored needle. Massage the gland. Repuncture and extract a little gland juice.

(v) Syphilitic rashes teem with *T. pallidum* which can be demonstrated by scrapping the lesion or applying a blister and examining the serum exudate.

(b) *Examination for treponemata*.—In the dry film method, where distortion of the spirochætes is combined with loss of

characteristic movements, the differential diagnosis is often especially difficult. No difficulty obscures the diagnosis if spirochætes are found in the exudate collected from an enlarged gland, or from a skin rash; treponemata can only be *pallidum*, *pertenuis* or *recurrens*; so that once yaws and relapsing fever can be excluded, the diagnosis of syphilis stands unchallenged.

The problem is very different when the slides have been taken from buccal or genital sores. Many of the spirochætes seen are probably not *T. pallidum* but the normal non-pathogenic inhabitants of these situations, which have contaminated the exudate. Of these, *Spirochæta balanitidis*, *S. refringens* and *S. gracilis* are the most frequently met with. One common characteristic they possess, which distinguishes them from *T. pallidum*, is a dazzling white appearance, which may become tinged with a rusty red as one approaches the limit of range of focus. *T. pallidum*, on the other hand, has a dead white appearance which is maintained throughout the whole focal range.

S. refringens is large, coarse, often with no definite spirals or great irregularity of spirals if they are present. It moves quickly.

S. balanitidis is small, fat, has only two or three spirals and darts rapidly too and fro across the field.

S. gracilis is very often confused with *T. pallidum*; the chief distinguishing characteristics are:

S. gracilis

Twice as thick as *T. pallidum*.
Five to six spirals to diameter of a red corpuscle.
Has rapid movements of translation apart altogether from any fluid movements under the cover glass.

T. pallidum

Very thin.
Seven to eight spirals to diameter of a red corpuscle.
Will remain for a long time in one field if not carried away by streaming movements.
Characteristic mobility in three directions:
A movement of translation in the direction of its long axis.
A slower revolution or rotation of the spiral, like a corkscrew, on its own axis.
A waving or twisting from side to side—like a whip lash.

S. gracilis

Not very flexible.

Longest forms tend to be shorter than the long forms of *T. pallidum*.

T. pallidum

Very flexible ; often forms acute angles.

Usually some very long forms are found, eighteen to twenty-four spirals.

S. microdentium is a normal inhabitant of the buccal cavity. It is very difficult to distinguish from *T. pallidum*. Diagnosis of syphilis, therefore, based on the demonstration of *T. pallidum* from buccal secretions or mucous patches should be made with circumspection. *S. microdentium* is said to be less flexible than *T. pallidum* and a rusty tint appears when the objective is raised above the focus.

Three methods of demonstrating *T. pallidum* may be used. The only reliable method, however, is the first :

- (1) Dark ground illumination.
- (2) Silhouette method.
- (3) Staining.

(1) *Dark ground illumination*.—A special condenser is required and an incandescent light. A “stop” or diaphragm is necessary inside the objective ; otherwise the best results will not be obtained. The manufacturers supply this with their microscopes for dark ground work. Condensers are of three varieties, one manufactured by Leitz, Swift and Baker being provided with a spherical surface reflecting lens, another (Zeiss and Spencer) with parabolic lenses and a third (Watson and Swift) is an immersion acromatic condenser with a sub-stage stop. The most suitable form of lighting for each variety is a “point light” or a Leitz “Monla” lamp ; next comes an electric arc light ; then sunlight.

The ordinary slides and cover slips used in laboratory work do not allow for good definition and in consequence specially thin glass should be obtained. Slides should not be more than 1.2 mm. thick, that is, twenty-one slides should measure approximately one inch in thickness. Watson’s dark ground condenser has the required thickness of slide marked on it ; it varies from 1.3 to 1.5 mm. The cover-slips should be those usually catalogued as extra thin ; they should be examined under a low power to ensure freedom from blemishes and scratches. The method of using the dark ground illumination is neither easy to describe nor to learn from a written description, and practical demonstration is essential.

(2) *Silhouette method*.—This method depends on the principle that, if a substance consisting of very minute particles, such as Indian ink, is spread on a glass slide and has no staining properties, a dark background is produced but light is allowed

to pass through microscopic objects in the film and shows them up in outline, white against a dark field. In this method, and in the staining method, transmitted light is used—*i.e.* light is transmitted through the object to be examined, whereas, in the dark ground method, reflected light is used—*i.e.* light is reflected from the object. One method may be compared to the light seen through an ordinary stained glass window and the other to flood lighting of the fascia of a building.

(a) *Collargol method*.—Make a solution of one part of collargol, in twenty parts of distilled water by shaking vigorously. Place a drop of collargol solution and a drop of serum on a slide and mix with a platinum loop. Spread with the edge of another slide and dry in air. The *T. pallidum* is seen as a white spiral in a yellowish field.

(b) *Congo red method (Benian)*.—Make a 2 per cent. solution of congo red in distilled water. Mix equal parts of the solution and serum from the sore, spread and dry in air. Gently flood the slide with a 1 per cent. solution of hydrochloric acid in absolute alcohol. Allow to act for one minute, then pour off and dry the film in air. The treponemata are unstained in a semi-opaque bluish-purple field.

(c) *Indian ink method*.—A little serum is taken up in a capillary pipette from the scraped edge of the sore. If any blood is present, allow the pipette to stand vertically until the serum has separated out on top. Express the blood and discard, then express a drop of serum on to a thin, clean slide. Place round the drop six to seven loopfulls of distilled water and an equal quantity of Indian ink (Gunther and Wagner). The three substances are then thoroughly mixed, spread on a slide, dried in air and examined with an oil emersion lens, when the treponemata appear white on the dark Indian ink background.

(d) *Opalblau and phloxrhodamin (Grubler)*.—Mix two parts of opalblau and one part of phloxrhodamin on a slide or in a watch glass; take a loopful of serum and mix on a slide with a loopful of the above mixture; spread with another slide as for a blood film, making the smear fairly thick. Treponemata appear white on a blue ground.

(3) *Staining*.—The treponema is not easily stained, as it does not retain the dye; methods have, however, been evolved.

(a) *Silver nitrate (Fontana, modified by Tribondeau)*.—A thin film is spread on an absolutely clean slide and allowed to dry. It should be as free as possible from blood cells.

All glass employed in the process should be chemically clean. Three solutions are used—a fixing, a mordant and a silver solution.

Fixative.—Formol acetic acid—Ruge's solution.

Acetic acid, pure	...	...	...	...	1 c.c.
Commercial formalin (40 per cent.)	...	...	...	...	20 c.c.
Distilled water	...	...	...	...	100 c.c.

Mordant.

Carbolic acid	...	...	...	...	1 gm.
Tannic acid	...	...	...	...	5 gm.
Distilled water	...	...	...	...	100 c.c.

Fontana's solution.

Silver nitrate	...	...	...	...	0.25 c.c.
Distilled water	...	...	...	...	100 c.c.

Dissolve the silver nitrate without heat. After the solution is complete, a quantity is placed in a clean measure and ammonia is added drop by drop by means of a pipette, the mixture being frequently shaken. A brownish precipitate appears which gradually darkens as more ammonia is added. The point comes when the precipitate dissolves. Now add more silver nitrate until an opalescence is reached which remains on shaking. This opalescence should be just faintly discernible as a haziness.

Technique.—On to the film pour fresh quantities of Ruge's solution two or three times, the last being allowed to remain in contact for five minutes. Then pour on absolute alcohol, or ether followed by alcohol. Pour off the alcohol (or flame) and replace by the mordant and heat gently until vapour rises (do not boil). The mordant is left on for thirty seconds. Wash thoroughly under the tap for thirty seconds and follow by a wash in distilled water. Pour on the silver solution and allow to act for a few seconds in the cold. Pour off and add a fresh quantity and heat gently until vapour rises. Leave the silver to act for a further fifteen seconds. Wash in distilled water and dry quickly with blotting paper.

Treponemata are stained dark brown to black and stand out very sharply. If the treponema are thickly coated immerse the film for five minutes in a 5 per cent. solution of sodium thiosulphate (photographic hypo.) and wash again under the tap for a few seconds; the film will be much reduced and the thickness of the treponemata will be more like that seen in dark ground illumination.

(b) *Leishman.*—Make as thin a film from the sore as possible and dry in air. Mix equal parts of the stain and distilled water and pour over the unfixed film. Allow the stain to act for half an hour, wash away very gently with distilled

water and dry in air. The organisms are stained rose red—it is stated that other spirillæ are stained blue.

(c) *Geimsa*.—This stain may be used in place of Leishman. Better results are obtained when the stain is diluted 1 in 15 and applied for twelve hours than if used more concentrated for a short time—steps must be taken to avoid evaporation of the stain.

None of these methods are nearly as satisfactory as the dark ground method for the following reasons :

(1) The thickness of the *T. pallidum* varies with the thickness of the film in the silhouette method.

(2) The characteristic appearance of the living organism is absent.

(3) There is a liability of great distortion of the treponemata and other spirochætes.

86. Changes in the Blood Serum.—It has been found that in syphilitic patients certain changes take place in the blood serum, and use of this fact is of value in diagnosis.

Tests of blood serum may be divided into two groups—that which depends on the “fixation of the complement” (the Wassermann reaction) and those which are “flocculation tests” (Kahn, Sigma, Meinicke, etc., tests).

Wassermann reaction.—If an animal is immunized by the injection of the red blood corpuscles of another, its serum acquires the power of destroying, by hæmolysis, the red cells of the animal against which it has been immunized. This hæmolysis cannot, however, take place without the presence of a body known as “complement,” which is present in all blood serum. Complement is easily destroyed by heat. It therefore follows that heated immunized serum (in which complement has been destroyed by heat) plus red cells results in no hæmolysis, but that, if normal serum (in which complement is present) is added, hæmolysis takes place.

Blood serum or cerebro-spinal fluid taken from a syphilitic patient contains a specific antibody and it has been found that, if this serum is mixed with certain extracts (*e.g.* of *T. pallidum*, syphilitic liver or even normal heart), antigen in the extract combines with antibody in the serum, forming an “antigen-antibody” combination—the true nature of this reaction is not fully understood. It has been further found that, if this mixture of serum and extract is added to normal serum, complement is “fixed” and rendered inactive by the antigen-antibody combination.

In the actual test, a rabbit is immunized against the red blood cells of the sheep and its serum collected and heated; this destroys complement but does not affect the “amboceptor” or immune body. Sheep’s cells, washed free from

serum, are taken and to them is added normal guinea-pig serum; they are then said to be "sensitized," *i.e.* have complement added to them. The serum to be tested is heated to destroy the complement in it. Amboceptor, sensitized sheep's cells, antigen extract and the serum to be tested are mixed together. If the unknown serum is normal, hæmolysis takes place as a result of the interaction between amboceptor and sensitized sheep's cells; but if the serum is syphilitic, antigen-antibody compound fixes the complement in the sensitized cells and no hæmolysis occurs.

The Wassermann test is specific. Yaws and leprosy are the only conditions other than syphilis in which a strong positive reaction may be obtained and even then the possibility of a leper also having syphilis is very great. Weak positive reactions may occasionally be obtained in scarlet fever, during the rigor stage of acute malaria, in acute tuberculosis, in malignant disease with jaundice, in urticaria pigmentosa and in certain other skin diseases. Occasionally a negative reaction may be met with in a known case of syphilis, and it has been shown that the consumption of a certain amount of alcohol by a patient, immediately before his blood is tested, will temporarily negative a positive blood. Pregnancy and the puerperium, bacterial contamination of serum, certain antiseptics, the addition of tissue juices, etc., are all liable appreciably to affect the result. The Wassermann test is extremely reliable and the main drawback to it is the elaborate technique involved.

The value of the Wassermann test and its place in the therapy of syphilis may be summarized as follows :

(1) A strong positive reaction is undoubted evidence of syphilis.

(2) The Wassermann test of the blood or cerebro-spinal fluid is an invaluable aid to the diagnosis of syphilis, especially in cases where clinical diagnosis does not reveal positive evidence of the disease.

(3) A negative Wassermann reaction does not prove the absence of syphilis, *e.g.* in the first three or four weeks of infection. Similarly, a negative reaction after a course of treatment does not necessarily indicate that the patient is cured.

(4) A positive test means syphilis, but not necessarily active syphilis.

(5) Once the diagnosis of syphilis in early localized ulcer is established, the patient should be treated independently of the Wassermann reaction, because negative reactions occur during treatment and relapses may occur long after apparent cure.

(6) Once a diagnosis of syphilis is made, tests should not be done too frequently. If the test remains positive, the patient becomes introspective and the physician's difficulties are increased.

(7) The Wassermann test should be employed as an aid to clinical diagnosis and not to supplant clinical common sense.

87. Flocculation or Precipitation Tests.—In recent years a considerable amount of work has been done to evolve precipitation tests of blood serum in an effort to provide an alternative to the elaborate Wassermann technique.

The Sachs-Gorgi, Kahn, Sigma, Meinicke and Vernes tests are the best known. They are all dependent on the fact that an antigen, prepared in a way somewhat similar to the Wassermann antigen, precipitates a globulin fraction in syphilitic blood serum. No hæmolytic system is required as an indicator in the tests, and as a result they are simpler to perform and take less time. The results are measured by the presence and amount of a flocculant precipitate when antigen and syphilitic serum are mixed together.

In practice the results are found to be parallel with the Wassermann test in from 90 to 96 per cent. of cases.

Verne's test is not often performed in this country; the *Sachs-Gorgi* and *Sigma* tests, although simpler and less complicated than the Wassermann test, require care and precision.

The *Meinicke* test is simple and requires no special apparatus. The serum used does not require to be inactivated. The method is much more rapid than the Wassermann and gives reliable results, even with septic serum. It is specially useful in cases under treatment, as it remains positive for longer periods than the Wassermann; it is not, however, sufficiently reliable to be used alone in sero-diagnosis of syphilis; weakly reacting positive results are not entirely trustworthy.

The *Kahn* test is undoubtedly the best and most reliable of the flocculation tests. The apparatus required is simple and cheap and the test easy and quick to perform and results are easy to read. It has the advantage over the Wassermann test in treated cases; it can, and does, replace the latter test in the sero-diagnosis of syphilis.

88. Directions for taking Specimens of Blood for Test.—The greatest care must be taken to carry out the whole process aseptically, as septic sera are useless for test purposes. A clean test tube should be taken and rendered sterile by boiling or flaming over a spirit lamp and allowed to cool.

Render the veins of the arm prominent by fastening a piece of rubber tubing round the upper part and making the patient

execute gripping movements of the hand. Thoroughly cleanse the skin with spirit over the most prominent vein in the front of the elbow and paint the part with tincture of iodine.

Fit two or more inches of rubber tubing to the butt end of a wide-bore hypodermic needle and sterilize. Insert the needle into the vein and direct the flow of blood into the test tube. In inserting the needle into the vein, hold it with its eye looking upwards and almost parallel with the vein and pointing in the direction of the flow of the blood.

Allow about 5 c.c. of blood to run into the sterilized test tube and plug the mouth of the tube with sterile cotton wool. In about fifteen minutes, *i.e.* after the blood has clotted, gently shake or rotate the test tube until the clot has become completely freed from the glass; otherwise the serum may not separate out properly. If the test tube is rinsed out beforehand with sterile normal saline, the clot will separate readily.

Sterilize a Wright's large capsule by heating it in the flame and allowing it to cool. Break off both ends and fill the capsule by allowing the serum to run down the short curved arm. Seal the straight arm of the capsule first. Care must be exercised to ensure that the capsule is firmly sealed to avoid leakage, that the contents are free from cells and not charred in the process of sealing.

As large a quantity of serum as possible should be obtained; at least two or three Wright's capsules, to allow for breakage in the post. The capsules should be posted within twenty-four hours of the blood being drawn.

Throughout the whole procedure great care must be exercised in labelling tubes to preclude any possibility of the sera of patients being mixed up.

89. Changes in the Cerebrospinal Fluid.—It has been known for a long time that syphilis may attack the central nervous system at a very early stage, and changes in the cerebrospinal fluid in its cell and protein content and in its Wassermann reaction have been found in the late primary and early secondary stages in at least 30 per cent. of all cases of syphilis.

In the early primary stage it is rare to find pathological changes in the fluid. In the late primary stage, with a positive Wassermann reaction in the blood, from 20 to 35 per cent. of cases show changes in the fluid. In the secondary stage changes are common; some authorities give a 30 per cent. figure and others as high as 66 per cent., and these changes may either precede or accompany the appearance of the rash.

The relationship between the skin manifestations of this

period and the involvement of the central nervous system is still a controversial subject, but the following may be quoted :

Macular rashes are associated with changes in the fluid in 34 per cent. of cases.

Papular rashes in 45 per cent.

Leucoderma in 70 per cent., and

Alopecia in 83 per cent.

There is, however, no absolute rule as to this association, and one authority found fluid changes in 70 per cent. of secondary cases (between the 4th and 12th months after infection) who had shown no secondary symptoms at all.

In tertiary cases it has been said that the fluid is normal unless there is actual specific meningitis, but it is most probable that at some time or other these cases do show changes in the cerebrospinal fluid.

In tabes dorsalis and general paralysis of the insane, changes in the cerebrospinal fluid are invariably found.

In congenital syphilitic children who show no symptoms of brain or cord disease, 50 per cent. are said to show changes in the fluid. In juvenile tabes and juvenile general paralysis, the fluid shows the same changes as in the adult forms of these diseases.

Early primary stage.—Practically the only change found is an increase in the cell count and possibly a slight increase in pressure.

Late primary stage.—An increase in the cell count and pressure ; protein content usually normal, but Wassermann reaction may be positive. The cells are all of the lymphocyte type in cases with only slight involvement, but where severe involvement of the meninges is present, polymorphonuclear leucocytes and plasma cells are found.

Secondary stage.—An increase in cells, pressure and protein and a positive Wassermann reaction. *T. pallidum* has been found in the fluid in this stage. The cell count varies from 10 to 50 per c.mm., may be over 100 per c.mm., but is seldom between 250 and 500. In the so-called "neuro" and "meningo-recidives," however, the count may go over 1,000 per c.mm. and be largely polymorphonuclears.

Tertiary stage.—The same changes as in the secondary, with a cell count between 50 and 500 per c.mm., of which the majority are lymphocytes, 10 to 20 per cent. being mononuclears and plasma cells and about 5 per cent. polymorphonuclears.

When, after treatment, the blood shows no signs of the disease and active signs are no longer discernible in the patient, the cerebrospinal fluid may still give a positive Wassermann

reaction in secondary and tertiary syphilis and so furnish the most reliable test of cure. Even after intensive treatment, changes in the fluid may be found, thus showing that the disease is not yet cured.

The following table shows pathological changes in the cerebrospinal fluid in various conditions.

Normal fluid

Pressure	...	...	100 to 200 millimetres of water.
Character	...	...	Clear and colourless.
Coagulation	...	...	Absent.
Cytology	...	...	0 to 10 cells—lymphocytes.
Globulin	...	...	Absent.
Protein	...	...	0·015 to 0·03 per cent.
Glucose	...	...	0·05 to 0·06 per cent.
Chlorides	...	...	0·72 to 0·75 per cent.
Wassermann reaction	...	...	Negative.
Lange's gold curve	...	...	0000000000 or up to 0001111000.
Bacteria	...	...	None.

Note.—Only abnormal characteristics are noted and, where not stated, the findings are normal.

Primary and secondary syphilis.

Cytology	...	...	8 to 98 lymphocytes.
Globulin	...	...	± to +.
Protein	...	...	0·02 to 0·06 per cent.
W.R.	...	...	Variable.
Lange	...	...	Normal or 1123210000.

Acute cerebrospinal syphilis.

Pressure	...	...	Increased. + +.
Cytology	...	...	50 to 500 lymphocytes, 75 per cent.
Globulin	...	...	+ to + +.
W.R.	...	...	Positive.
Lange	...	...	5542210000 or 1355421000.

Chronic cerebrospinal syphilis.

Pressure	...	...	Increased. +.
Cytology	...	...	10 to 50 lymphocytes.
Globulin	...	...	+ to + +.
Protein	...	...	0·03 to 0·15 per cent.
W.R.	...	...	Positive in 10 to 50 per cent.
Lange	...	...	1344210000.

Tabes dorsalis.

Cytology	...	...	10 to 75 lymphocytes.
Globulin	...	...	\pm to +.
Protein	...	...	0.03 to 0.06 per cent.
W.R.	...	...	Positive in 70 per cent.
Lange	...	...	0244210000 or 0022100000.

General paralysis.

Pressure	...	...	Increased. +.
Coagulum	...	...	Small.
Cytology	...	...	30 to 200 lymphocytes.
Globulin	...	...	+ to + + + +.
Protein	...	...	0.05 to 0.1 per cent.
Glucose	...	...	May be reduced.
W.R.	...	...	Positive in 100 per cent.
Lange	5555431000.

Disseminated sclerosis.

Lange	0000110000, 5542100000 or 1133210000.
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Cerebral abscess.

Cytology	Slight increase. Mixed.
Protein	0.03 to 0.06 per cent.
In "leakage abscess" glucose and chlorides fall.			

Acute meningitis.

Pressure	...	...	Marked increase.
Character	...	...	Yellowish, cloudy.
Coagulum	...	...	Thick.
Cytology	...	...	100 to 5,000 polymorphonuclears.
Globulin	...	...	+ + + +.
Protein	...	...	0.05 per cent. upwards.
Glucose	...	...	\pm to -.

Tubercular meningitis.

Pressure	...	...	Usually increased.
Character	...	...	Clear.
Coagulum	...	...	Fibrin web.
Cytology	...	...	80 to 1,000 lymphocytes.
Globulin	...	...	+ + to + + + +.
Protein	...	...	0.05 per cent upwards.
Glucose	...	...	\pm to -.

Epidemic encephalitis.

Pressure	...	...	Normal or increased.
Character	...	...	Normal, bloody or yellowish.
Coagulum	...	...	Fibrin clot occasionally and fine.
Cytology	...	...	10 to 100 lymphs.
Glucose	...	...	Increased.
Lange	...	...	0011210000.

Polioencephalitis.

Pressure	...	...	Increased.
Character	...	...	Normal or opalescent.
Coagulum	...	...	Fibrin web occasionally.
Cytology	...	...	0 to 2,000 early, polys and later lymphs.
Glucose	...	...	+
Lange	...	...	0000123210.

90. Laboratory Methods.

(1) *Cell count*.—Add one part of 1 per cent. methyl violet in 10 per cent. acetic acid to ten parts of fluid and count in a blood counting chamber or on a Fuchs-Rosenthal slide. For the latter, count all the squares and divide the total number of cells by 3 (for precise work, multiply by 10/9 and divide by 3·2). This gives the number of cells per c.mm.

(2) *Globulin test*.

(a) *Nonne-Apelt*.—1 c.c. of a saturated solution of ammonium sulphate (made by adding an excess of ammonium sulphate crystals to water so that, after heating, a few crystals remain at the bottom) is placed in a small test tube and on top of it is floated an equal quantity of fluid to be tested. The formation of a turbid ring at the junction of the fluids within three minutes indicates globulin—the mixture should become turbid on shaking.

(b) *Pandy*.—Drop one drop of cerebrospinal fluid into a test tube containing 10 c.c. of 5 per cent. carbolic acid. If globulins are present, a slowly spreading white cloud develops at once round the drop of cerebrospinal fluid.

(3) *Lange's test*.—This is a laboratory test carried out with a colloidal solution of gold and depends on changes in colour of the various dilutions. Colloidal mastic and colloidal benzoin tests have been devised as simpler modifications.

91. Lumbar Puncture.—The patient should recline in

bed on his side with the knees well drawn up so as to arch the back and separate the lumbar spines. A horizontal line is drawn through the vertebral column across the iliac crest which passes over the interspace between the third and fourth lumbar vertebræ, and this is the space for puncture. The puncture should be made in the middle line or just outside it (about a $\frac{1}{4}$ in.). The skin should first be infiltrated with 1 c.c. of 2 per cent. novocaine.

Strict asepsis is essential, both as regards the patient's skin and the operator's hands and instruments. The needle should not be less than 4 in. long and not larger than a number 20 standard gauge (the finer the bore, the less the risk of post-operative headache), and the White-Jeanselme pattern, as supplied to military hospitals, is one of the best.

Another method is for the patient to be in a sitting posture on an operating table with his legs hanging over the side; a good arch to the spine can be obtained in this position and it is much easier and more convenient for the operator.

The first twenty or thirty drops should be rejected to ensure the absence of blood. Draw off 5 to 10 c.c.

Practical hints.—The finer the needle, the better for the patient.

The point of the needle should not be very sharp and the bevel should be short. Smoothness rather than sharpness of the needle is desirable. The stilette, when pushed home, must fit accurately to the sharp end of the needle.

Before insertion, wipe the outside of the needle with sterile liquid paraffin. This facilitates insertion and tends to prevent invagination of the arachnoid into the dura on withdrawal.

Have the bevel of the needle pointing to the side of the body. Withdraw the needle with a rotating movement until the flow ceases.

There is a characteristic feeling when the needle enters the canal; withdraw the stilette when you get this feeling. If no fluid appears, or if the flow is very slow, rotate the needle a quarter of a circle. If there is none after this, turn the bevel again towards the side of the body and push the needle a little farther in.

If there is any suspicion of cerebral tumour, have the patient in the recumbent position for the puncture and keep him lying down afterwards for at least twelve hours. The recumbent position is best generally for patients. Put on a collodion dressing after the puncture.

After puncture, keep the patient lying down with the head low for at least two hours. Some authorities advocate laying him face downwards with a doubled-up pillow under his abdomen.

Post-operative headache may be avoided by the subcutaneous injection of 1 c.c. of pituitrine. Luminal, bromides, etc., may be required and, if these fail, the intravenous injection of 100 to 200 c.c. of sterile distilled water may give relief.

92. Cisternal Puncture.—Recently, puncture of the occipito-atlantoid ligament has been advocated. It has not, however, come into common use owing to its apparent dangers.

The cisterna magna lies just in front of the occipito-atlantoid ligament. From the skin surface to the ligament is, roughly, from 3 to 5 cm. ; immediately under the ligament is the dura mater and the arachnoid mater. The subarachnoid space under this is from 1.5 to 2 cm. deep. It is claimed that puncture headache is much less frequent after cisternal puncture than after lumbar puncture.

93. Treatment.—For purposes of treatment, syphilis is conveniently divided into six stages :

(1) *Early primary.*—Cases in which *T. pallidum* have been found in the sore and the initial Wassermann reaction is negative and remains negative even after the beginning of the treatment.

(2) *Medium primary.*—Cases in which *T. pallidum* have been found in the sore and the initial Wassermann reaction is negative but the second one, one week after the first injection of arsenicals, is positive.

(3) *Late primary.*—Cases in which *T. pallidum* are present in the sore and the initial Wassermann reaction is positive.

(4) *Secondary.*—Cases in which secondary symptoms have developed. Cases in which the Wassermann reaction is strongly positive at the time of the first injection should be included under this category.

(5) *Tertiary.*—Cases in which tertiary symptoms have developed or in which, with or without symptoms or signs, the Wassermann reaction is found to be positive some considerable time after the initial infection. Congenital cases are included in this category.

(6) *Parasyphilis.*—Cases of tabes, G.P.I., etc.

Every patient with a sore should be put on normal saline dressing only to the sore. The sore should be cleaned up as soon as possible and dark ground examination performed. If the first examination is negative, further tests should be carried out daily for at least three days. If all prove negative, the sore can be treated with antiseptics with a view to cure. A blood specimen must be taken as early as possible for a Wassermann test. Cases in which scrapings do not show *T. pallidum* and in which the first Wassermann reaction is

negative should be submitted for Wassermann test fortnightly for a period of three months from the date of the appearance of the sore.

If *T. pallidum* are not found in the sore and there is doubt as to the possibility of syphilis, gland puncture should be performed as described in para. 85 above.

Should all these results prove negative and there have been no apparent clinical signs of syphilis during the three months, then, and then only, syphilis may be excluded and the case be diagnosed as "soft sore."

In cases in which there is any suspicion of syphilis, in spite of the absence of signs and symptoms and the laboratory findings having all proved negative, the Wassermann test should be repeated weekly, up to three months from the appearance of the sore, or until a positive reaction is obtained, or clinical signs of syphilis appear—whichever should occur first. An "incomplete" result should be read as no test and the test repeated, unless the officer performing it states otherwise.

94. It must be remembered that the earlier the treatment of syphilis is instituted, the more hope there is of eradicating the disease. The disappearance of the signs and symptoms of syphilis does not in any case mean that the disease is cured. Even with the remedies which we at present possess, treatment must be continued and observation of the case kept up for long periods after the disappearance of all signs of the disease. In addition, each individual case must be treated as an entity, the treatment varying with the type and nature of the disease, the tolerance of the patient to treatment and the effects obtained from the different drugs exhibited. Courses of treatment noted below are only intended as a guide; they are the result of a very careful analysis of thousands of cases and have shown the best results on the average.

General treatment.—The maintenance of the general health of the patient is an important factor. In the early and infectious stage he is kept in hospital, where he has regular hours, takes a certain amount of regular exercise and has a sufficiency of sleep. Hospital treatment usually lasts, in the Army, for about the first three weeks of treatment—*i.e.* until after the third weekly injection; the patient should not be discharged until the sore has healed and the rash faded, etc. During the course of treatment alcohol should be absolutely forbidden, as it is not only prejudicial to the disease, but tends to give rise to intolerance to specific treatment. Tobacco should be allowed only in moderation, partly on account of specific lesions in the mouth and

partly because it interferes with the proper hygiene of the buccal cavity while mercury and bismuth are being administered. During treatment the sexual act should be prohibited. Special diet is not necessary. In any case in which, during treatment, the patient begins to lose weight, or shows signs of anæmia, treatment with iron and strychnine is always advantageous. It is often an advantage, during the intervals of intensive treatment, to administer a tonic such as Easton's syrup, or a combination of Easton's, Parrish's and Fellow's syrups.

95. Local Treatment.—In simple uncomplicated chancres, with no septic element in them, calomel ointment in a strength of $33\frac{1}{3}$ per cent. may be applied. Some authorities advocate the rubbing into the site of the sore a quantity of calomel ointment daily for as long as there is any palpable or visible sign of disease. If it is desired to keep the parts drier, equal parts of calomel and calamine powder may be rubbed in night and morning. In a chancre of the lip 10 per cent. calomel ointment or 10 per cent. ammoniated mercury ointment may be used. Before applying the ointment or the powder, it is advisable to bathe the parts in some antiseptic lotion such as eusol, biniodide of mercury, 1/10,000, or acid carbolic, 1/60. If the chancre is large and shows a considerable degree of induration, it is often helpful to inject directly into it 0.2 gms. of a proprietary arsenobenzol preparation known as "Hectine."

If there is added sepsis or chancroidal ulceration, the sore must be treated on surgical lines, *i.e.* by establishing free drainage, by dorsal slit of the prepuce if necessary, frequent hot fomentations, etc. Opposing surfaces must always be kept apart with strips of gauze.

Condylomata should be well washed with eusol, perchloride of mercury or black wash, dried and dusted with calomel powder. The essence of the treatment lies in dryness and cleanliness.

Mucous patches should be touched with chromic acid, 10 per cent., or perchloride of mercury, 1 per cent., in equal parts of rectified spirit and water, or tincture of iodine, or silver nitrate, 10 per cent. The acid nitrate of mercury, 5 per cent. in water, is also excellent for clearing up mucous patches, and also for ulcerated or infiltrated patches on the tongue which may occur in the later stages of syphilis. Give a mouth wash of potassium chlorate, or 2 minims of acid nitrate of mercury in 2 oz. of water.

In pustular conditions such as rupia, hot antiseptic baths containing potassium permanganate, etc., are valuable for cleansing the skin.

96. Specific Treatment.—Before treatment is begun, each patient should be thoroughly examined, as if for life insurance.

The following conditions are indications for caution with regard to dosage, and in particular the intervals between doses.

- (a) Syphilitic involvement of the central nervous system.
- (b) Cardiac disease, especially myocarditis.
- (c) Aneurysm and arteriosclerosis.
- (d) Severe pulmonary disease, especially such as is associated with septic absorption from dilated bronchi and lung cavities.
- (e) Septic conditions generally, such as septic ulceration of the throat.
- (f) Hepatic disease, as evidenced by enlargement or cirrhosis, and defective elimination of bile.
- (g) Chronic catarrh of the stomach and intestines.
- (h) Renal disease with hæmaturia, albuminuria or casts, or all of these. The amount of urine passed in the twenty-four hours should be measured and any marked departure from the normal amount should be considered as an indication for caution.
- (i) Alcoholism.
- (j) Hæmophilia.
- (k) Any constitutional tendency to dermatoses, such as erythema, eczema and psoriasis, as well as severe seborrhœa of the scalp.
- (l) Addison's disease.
- (m) Diabetes.

Careful watch must always be maintained for signs of intolerance. Before each injection is made, the patient should be carefully examined for signs of stomatitis, patches of urticaria, anæmia, loss of weight, the presence of albumin in the urine, or signs indicating that he is not reacting normally to treatment. He should be interrogated as to any abnormal symptoms that he may have experienced as a result of previous injections. Any abnormal reactions discovered should be entered on his card for further reference, as should also the result of urine examination and weight.

As jaundice is a sign of intolerance, and experience has shown that sugar acts as a liver protective against the toxic effects of the drug, $1\frac{1}{2}$ oz. of cane sugar in the form of syrup should be given to each case half an hour before the injection of the arsenical preparation; the addition of a drachm of bicarbonate of soda is advantageous.

The drugs which have a specific action in syphilis are organic arsenic preparations, bismuth metal and its salts, mercury and its salts. Potassium iodide, although it has no specific action, may conveniently be considered under this head.

97. Organic Arsenic Preparations.—In 1909 Ehrlich, as a result of experiment, produced the arsenical preparation dioxy-diamido-arseno-benzol-bihydrochloride. It was the result of his 606th experiment, so he called it "606." This compound was first put on the market for therapeutic use in 1910 under the name of "salvarsan." It is a yellowish, crystalline, hygroscopic powder containing about 31 per cent. of arsenic. It readily decomposes in air, forming a highly poisonous compound, and consequently has to be kept in an atmosphere of nitrogen or other inert gas. Similar preparations were produced in other countries—arseno-benzol (France), kharsivan (Great Britain), diarsenol (Canada), arsphenamine (United States of America), etc.

At a later date, as a result of his 914th experiment, Ehrlich produced "914," which is the result of a condensation product of formaldehyde-sulphoxylate of soda with dioxy-diamido-arseno-benzol. It is an orange yellow powder containing 22 per cent. of arsenic. It is even more liable to become toxic on exposure to air. Similar products produced in other countries are novarsenobillon, neokharsivan, neodiarsenol, neoarsphenamine, etc.

In general, it may be stated that the "606" preparations have a higher spirochæticidal value than the "914" ones, but at the same time they are more toxic and give rise to greater reaction subsequent to their administration. The preparation "606" for its administration requires a more complicated technique than the "914" drug, and the former can only be given intravenously, while the latter may be given intravenously, intramuscularly or by deep subcutaneous injection. When administered intramuscularly or by deep subcutaneous injection, the "914" drug is as potent a therapeutic agent as "606" intravenously. The dosage with "606" is (average) 0.3 gm. for the initial dose and 0.5 as a maximum; in "914," the average initial dose is 0.45 and the maximum 0.6, exceptionally 0.75.

Within recent years, several new preparations of the "914" group have been introduced. These products contain a sulphurous acid radicle which increases the spirochæticidal action of the drug and also renders it less toxic. These drugs give rise to little or no local pain at the site of injection, are less toxic and are more stable on exposure to the atmosphere. They are therefore the drugs of choice for intramuscular and deep subcutaneous injection. The best known of these are sulpharsenol, kharsulphan, myosalvarsan, sulphostab, sulpharsphenamine and a product recently produced in India—thiosarmine.

More recently still, an attempt has been made, with success,

to produce the drug in a sufficiently stable form to issue in ampoules in solution ready for immediate injection ; some of the solutions also contain glucose. The best known are stabilarsan, sulphoxyl-salvarsan, novostab, etc.

Silber-salvarsan and neosilber-salvarsan are combinations of sodium salvarsan with silver ; the former is less toxic than the original " 606 " and is perhaps the most potent of all the arsenical drugs at present in general use. It is a black amorphous powder and the solution, which must be filtered before use, is given intravenously. The average dose is 0.05 to 0.25 gm. dissolved in from 10 to 30 c.c. of cold, sterile, doubly distilled water. It is specially useful in cases of neuro-syphilis.

Tryparsamide, a sodium salt of N-phenyl-glycineamid-p-arsenic acid, has given very favourable results in the treatment of syphilitic infection of the central nervous system ; also in resistant cases of interstitial keratitis and in cardiovascular disease. It also has a very beneficial tonic effect on the patient. It is a white amorphous powder containing 25 per cent. of arsenic. It can be given either intravenously or intramuscularly in doses of from 2 to 3 gms. dissolved in from 10 to 20 c.c. of cold sterile doubly distilled water for intravenous and 3 c.c. for intramuscular use. The addition of glucose is an added advantage.

In the Army, a great deal of research work has been done in an effort to determine which drug is the best for routine use and it has been found that drugs of an apparently similar chemical composition vary widely in toxicity, in therapeutic power and in keeping properties, especially in tropical climates. Unfortunately, as toxicity is reduced, so the therapeutic value diminishes. The preparation of choice appears to be sulphostab ; it has been found to be very stable, even in the tropics, comparatively non-toxic and to have a high spirochæticidal value. It is easily soluble and gives little pain at the site of injection.

Novostab is slightly more toxic but has a very high therapeutic value and is to be recommended as a rapid method for getting the case under the influence of arsenicals. It does not, however, keep well in the tropics.

Tryparsamide and silber-salvarsan are to be recommended for neuro-syphilis.

98. General Dosage of Arsenical Preparations.—For a healthy adult male, the maximum dose of sulphostab is 0.6 gm. It must be noted, however, that the dosage must be regulated by the weight and condition of each patient and that the doses given in the courses described later are those for a healthy adult male of 140 lb. weight. For women, smaller

doses are required. For children one month old, give 1·5 centigrammes, increasing to 8·2 at the end of a course of six injections. Older children may be given 4 to 6 centigrammes, increasing to 20, 30 or 36 at the end of the course.

99. Storage, etc., of Arsenical Preparations.—All tubes of arsenical preparations should be kept under the same conditions as vaccines (ice box temperature, etc.), and the stock kept as low as possible.

The name of the preparation used, the name of the manufacturer and the batch number of each ampoule should be entered in a book against the name of each patient receiving an injection.

Should toxic symptoms follow the use of arsenical drugs employed in the treatment of syphilis, particulars should at once be forwarded (in India, direct to the Director of Medical Services and accompanied by three samples of the same batch of the drug used). In the case of samples in which the general appearance of the contents of the ampoules appears to indicate that deterioration has taken place of a large proportion of the ampoules in the batch, samples should be sent direct to the medical stores from which the supply was issued. In the case of a batch in which the majority of samples appear to come up to specification, but in which the contents of individual ampoules only appear to have deteriorated, such individual ampoules should be destroyed without reference to higher authority.

100. Method of Administration of Arsenical Preparations.—Arsenical preparations, when given intramuscularly or by deep subcutaneous injection, are excreted more slowly than is the case when they are administered by the intravenous route; further, it is noteworthy that a higher percentage of negative Wassermann results has been obtained in early cases treated by these methods.

Intramuscular injection.—Examine the unopened ampoule of the drug to ensure that the contents are of good colour, and not caked or sticking to the glass. Immerse the ampoule in spirit to see if there are any minute cracks in the glass. Open the ampoule with a file and inject into it, with a syringe, the required quantity of sterile, cold, doubly distilled water. Rotate the ampoule until all the powder has dissolved. The powder should be amorphous and not caked and should make a clear orange-coloured solution with a garlic-like smell. Draw up the solution into the barrel of the syringe. Take the needle from the syringe.

Stand the patient with his back to the operator and tell him to take his weight off the leg into which the injection is

to be made. Select the outer and upper quadrant of the buttock and paint with iodine. Insert the needle with a rapid movement deep into a point about one hand's breadth below the iliac crest and one hand's breadth from the middle line of the body. See that no blood is oozing from the needle ; if there is, withdraw it and reinsert in a fresh place.

Attach the syringe to the butt of the needle and inject very slowly. After injection, rotate the needle and draw it out, pinching the skin and subcutaneous tissue on either side of it so as to wipe the needle with them. Massage the site vigorously with a large pad of cotton wool sewn up in lint.

Deep subcutaneous injection.—The preliminary procedure and site of injection are the same as for intramuscular, but in this method the object is to deposit the dose on top of the fascia which covers the gluteal muscles. This is the method of choice, because it causes far less pain.

Grip the skin in the centre of the prepared part with two fingers and the thumb. Pull up the skin and subcutaneous tissues forcibly from the deep fascia. Into the side of the cone thus formed insert the needle and direct it downwards towards the base of the cone, until the deep fascia is reached. This can be verified by moving the point of the needle from side to side, when it will be felt to scrape the tense fascia. An alternative method is to withdraw the needle slightly and run it deeper so that the fascia is perforated at a slope ; then, with the point of the needle levered outwards, withdraw slowly until a characteristic click is felt by the fingers, indicating that the fascia is no longer pierced. Proceed as in intramuscular injection.

Intravenous injection.—Preparation of the drug is made in the same way as for intramuscular injection but a larger quantity of water is used to make a weaker dilution. The patient is prepared as for taking blood for the Wassermann test. A prominent vein in the bend of the elbow is selected and the needle, attached to the syringe containing the solution, is inserted. A little blood is withdrawn to ensure that the needle is in the vein, the tourniquet is removed and the injection made slowly. After injection, the needle is withdrawn and the puncture sealed with a small piece of plaster.

In all cases, before giving arsenical preparations, the patient's bowels should be kept well open and he should not have a heavy meal for at least two hours.

101. Intolerance and Toxic Effects of Injections of Organic Arsenical Compounds.—As previously stated, the organic arsenical preparations are very toxic and the margin between toxic and therapeutic doses is very narrow.

Furthermore, patients vary in their reactions to the drug. Great care should, therefore, be exercised and, before each injection, a careful examination of the patient should be made and the following points accurately noted :—

Weight—and any loss since last injection.

Urine—whether albumin and/or casts are present, and any reduction in the quantity of urine passed, or increased frequency of micturition.

Skin—presence of itching, a rash or pigmentation, or any history of such after last injection. (Seborrhœa or eczema accentuate the tendency to arsenical erythema and dermatitis, and indicate caution in treatment.)

Jaundice.

Gastro-intestinal disturbance—diarrhœa, loss of weight, loss of appetite, nausea and vomiting.

Stomatitis.

Vaso-motor disturbances—dilatation of the pupils, rapid pulse, giddiness, syncope, precordial distress and coughing, congestion of the face.

Fever.

Cerebral symptoms—headache, nervous or mental changes or history of epileptiform convulsions.

Jarisch-Herxheimer reaction—*see* para. 67.

When signs of intolerance are observed, the dose should be reduced and the intervals between doses increased. Occasionally arsenical treatment should be stopped for a period commensurate with the degree of intolerance present. A strongly positive Wassermann reaction increases liability to pronounced Jarisch-Herxheimer reaction and demands cautious rather than intensive treatment. A severe reaction after the initial dose should always be taken as a warning and the next dose should be reduced until it is found what maximum dose the patient can best tolerate. The cumulative effect of arsenic must always be borne in mind.

Once a patient has begun a course of treatment, it is important to insist on regular attendance ; not only with the object of effecting cure, but also because it has been found that toxic symptoms and signs of intolerance are more common in patients with irregular attendances than in those who attend at regular intervals.

Some patients are very nervous and dread their injections, and may show symptoms of syncope and nausea with the introduction of the needle and before any drug has been injected at all ; these cases are due entirely to fear or nervousness and are more likely to occur if pain has been caused during previous injections.

102. Toxic reactions following the administration of organic arsenical preparations, and their prophylaxis, may be summarized as under :—

Cause

Prophylaxis

I. Due primarily to the drug.

- | | |
|---|---|
| 1. Toxic physical properties of solutions. | 1. Avoid old preparations over two years old. |
| 2. Production of agglutination of red blood cells and precipitation of plasma contents. | 2. Cast cracked ampoules. |
| 3. Production of hæmolysis. | 3. Cast drugs of changed colour. |
| 4. Toxic chemical effects of arsenical oxidization or reduction. | 4. Cast drugs with strong odour. |
| 5. Toxic chemical effects of arsenic. | 5. Cast preparations difficult of solution. |
| 6. Toxic chemical effects of non-arsenical impurities. | 6. Do not inject any solution unless clear. |
| | 7. Do not mix up different preparations. |

II. Due primarily to the patient.

- | | |
|---|---|
| 1. Fear and nervousness. | 1. Allay fear and nervousness. |
| 2. Disturbances of internal secretion. | 2. Avoid undue haste. |
| 3. Focal infections. | 3. Avoid constipation. |
| 4. Natural or acquired hypersensitiveness to arsenical compounds. | 4. Do not inject immediately after a heavy meal. |
| 5. Production of Jarisch-Herxheimer reaction. | 5. Give preliminary thorough medical examination ; eliminate any focus of infection. |
| 6. Pathological changes due to non-syphilitic diseases. | 6. Examine urine for state of the kidneys. |
| 7. Pathological changes due to syphilis. | 7. Take weight. |
| 8. Production of syphilitic recurrences. | 8. As a routine give 4 oz. of a solution of $4\frac{1}{2}$ lb. of cane sugar dissolved in $2\frac{1}{2}$ pints of water about 20 to 30 minutes before each injection. |
| 9. Pathological changes due to drugs—arsenic, mercury, bismuth. | 9. Give a small dose for the first one. |
| | 10. Avoid strong Herxheimer. |

*Cause**Prophylaxis*II. Due primarily to the patient—*continued*.

11. In intramuscular therapy, give injections deep into the muscle; avoid injecting into fatty tissues and neighbourhood of large nerves.
12. Estimate liver function in special cases.
13. If acute nitritoid crisis reaction is expected, give $\frac{1}{50}$ gr. atropine alone or with $\frac{1}{10}$ dose of the drug about an hour before main injection.

III. Due primarily to preparation or administration.

- | | |
|--|---|
| 1. Use of defective water. | 1. Use only freshly distilled water. |
| 2. Excessive dilution. | 2. Do not use hot water. |
| 3. Too concentrated solution. | 3. Dissolve drug with minimum of shaking. |
| 4. Too rapid intravenous injection. | 4. Inject slowly; $\frac{1}{2}$ min. per 0.2 gm. |
| 5. Oxidation and other chemical and physical changes in the solutions. | 5. Do not use too concentrated solutions; take at least 1 c.c. of diluent for intramuscular and deep subcutaneous injections. |
| 6. Embolus from undissolved drug, air, foreign body, etc. | |
| 7. Injection of perivascular tissues during intravenous therapy. | |

103. Clinical classification of toxic reactions following injections of organic arsenic compounds :—

I. Immediate (during or immediately after injection).

1. "Nitritoid crises."

(a) Mild.

(b) Severe.

II. Early (within twenty-four hours after injection).

1. Gastro-intestinal reaction.
2. Protein and colloidal shock reaction.
3. Injection faults—thrombosis, phlebitis, perivascular infiltrations, etc.

III. Late (one day to several weeks after injection).

1. Hæmorrhagic encephalitis.
2. Dermatitis and allied reactions.
3. Neuritis.
4. Jaundice.

Probably the first effect, and due to physiological action on the vasomotor system, is a peculiar odour and metallic taste with a feeling of fullness in the head and slight flushing of the face, which passes off in a few minutes or seconds.

104. Nitritoid Crises.—(a) Mild. A slight perspiration may follow the above flushing, and a feeling of faintness, which quickly passes off. Sometimes nausea and even vomiting or retching may occur, more especially if an injection has been given immediately after a meal. In some chronic latent cases after the first injection or so, the patient may complain after a day or two of malaise, loss of appetite and vague cardiac pains.

A fairly typical reaction would be as follows :—

The patient first complains of a peculiar metallic or garlic like taste and a queer feeling of fullness in the head with pain in the gums and teeth, slight nausea and a burning feeling in the skin of the face and head, perhaps more especially in the lips and tongue. There may be immediate vomiting. The face, especially the cheeks and ears, is flushed, with sometimes injection of the conjunctivæ, dilatation of the pupils and even lacrymation. Sometimes the only symptoms are syncope with headache and nausea or immediate flushing and burning of the face, nausea and vomiting.

(b) Severe. The tongue and lips are much swollen and dark in colour, the voice husky and there is cough from congestion and swelling of the mucous membrane of the respiratory tract. The pulse, at first rapid and bounding, may become weak and rapid with marked pallor and profuse perspiration—a state of shock in fact. There may be retching and vomiting, loss of control of the sphincters, shallow respiration and coughing.

The patient thinks he is going to die, looks rather like it, but rarely does. He may become unconscious for a short time and convulsive twitchings may come on. Urticarial patches on various parts of the body are not uncommon.

105. Gastro-intestinal Reaction.—This reaction is really part of the nitritoid crisis, but is considered separately for convenience.

Immediate nausea and vomiting may follow an injection, especially if it has been given immediately after a meal, or

vomiting may occur alone. In others, there may be no immediate symptoms, but within twenty-four hours, and often within from one to four hours, any or several of the following may develop :—

Nausea, vertigo, headache, intense thirst, vomiting, diarrhœa, etc.

Mild reactions of this kind are said to be the most common toxic reactions following arsenical injections, but these may not develop until after the sixth or later doses. There is another form of gastro-intestinal reaction which develops later and in association with dermatitis and jaundice.

106. Protein and Colloidal Shock Reactions.—Formerly this was often known as “water reaction,” and is quite apart from arsenic. It is liable to occur if stale distilled water is used, or saline made up with stale water, or water containing dead organisms. The symptoms come on from one to four hours after injection. There may be moderate fever (100° to 102° F.), rigors, perspiration, headache, nausea, etc.

Perivascular infiltrations.—With careful technique, this should never occur.

107. Hæmorrhagic Encephalitis.—This very serious reaction might properly be called acute cerebromeningeal congestion and œdema, as this aptly describes the condition.

It usually occurs in old standing cases in which treatment has been intermittent and which show signs of relapse. Arterial and meningeal syphilis, gumma of the brain, especially in a “silent” area, are specially liable to develop this condition. The reaction is in the nature of a Herxheimer and consequently, if there is any suspicion of a likelihood of the condition occurring, it is safer to begin treatment with pot. iod., mercury or bismuth.

Dangerous symptoms come on two or three days after injection and most frequently after the second injection of the series—the so-called serous apoplexy. In this condition there is intense cerebral and meningeal congestion, serous exudation with greatly increased pressure and with multitudinous petechial hæmorrhages throughout the brain. In the milder cases there may be only severe headache, fever and vomiting, but in practically all cases the patient has shown some of the signs of nitritoid crisis at the time of his injection which have passed off until three or four days afterwards, when the cerebral symptoms have appeared.

The patient becomes restless and apprehensive, has severe headache, œdema of the face, vomiting and dyspepsia, becomes unconscious with signs of cerebral irritation, *e.g.*

clenched teeth, epileptiform convulsions or general twitchings, cyanosis, rapid and stertorous respirations followed by shallow, irregular breathing as the respiratory centre becomes exhausted.

Once established, the condition nearly always terminates fatally. Coma, Cheyne-Stokes respiration, incontinence of urine and fæces, and death in twenty-four to forty-eight hours. The cerebrospinal fluid is under greatly increased pressure.

108. Dermal Reactions.—*Classification.*

I. Mild and early skin lesions.

1. Simple erythematous, macular or a combination of the two.
2. Urticaria.
3. Herpes zoster or simplex (especially on the lips).
4. Exacerbation of existing syphilitic rashes (Jarisch-Herxheimer reaction).
5. Pruritus.

II. Severe and late skin lesions.

1. Dermatitis.

- (a) Scarlatiniform with desquamation.
- (b) Erythema multiforme.
Papular—small or large.
Vesicular—small or bullous.
- (c) Lichen planus.
- (d) Acute exfoliative.

III. Chronic and recurrent skin lesions.

1. "Fixed" arsenical rashes.
2. Pigmentation.
3. Arsenical hyperkeratosis.
Palmar.
Plantar.

109. Erythemato-macular Rash.—This is fairly common, occurs as a rule during the first week or two of treatment and on the arms and legs, perhaps with extensions over the body. It is usually accompanied by general symptoms of fever, malaise, nausea, etc. As a rule it disappears in a couple of days or so without desquamation.

Urticaria.—This may occur during a "crisis," within two to three hours after injection, or in fact at any time after treatment. It lasts only a few days as a rule, but, once it has appeared, it is very apt to recur.

Herpes.—This is a very rare complication; the labial is particularly likely to appear after the first injection.

Herxheimer skin reactions.—These consist of an accentuation of existing rashes of acute early syphilis. If such a rash has been missed and is seen only during a Herxheimer, it may be taken for a toxic arsenical one.

Pruritus.—Itching is a very important warning symptom of an impending severe dermatitis, unless arsenical treatment is stopped at once. It may be general or merely localized to the palms and soles.

Dermatitis.—This is always a serious complication and takes many forms. It develops, as a rule, after six or more injections have been given, but has appeared after a single one. It may appear suddenly on the extremities as a scarlatiniform rash, gradually spreading to the trunk and disappearing in a few days with desquamation. Or it may be morbilliform, papular or vesicular and followed by marked scaling and exfoliation—the condition known as exfoliative dermatitis.

Exfoliative dermatitis.—This usually begins as a scarlatini-form rash, rapidly becoming confluent, on the flexor aspect of the forearms, then spreading to the face and, in a short time, all over the body. Small vesicles appear behind the ears and on the sides of the nose; blebs and pustules form all over the body which, on rupturing, leave crusts and scales. Itching may be severe; there may be complete loss of hair. The skin of the face and head becomes puffy and swollen from serous exudation, and the conjunctivæ inflamed.

A condition similar to weeping eczema develops wherever there are folds of the skin, *e.g.* the backs of the ears, axillæ, scrotum, perineum, etc., and abscesses all over the body are common. There is a general, and as a rule well marked, adenopathy.

The skin at first is bright scarlet, turning later to reddish brown and, when exfoliation is well established, becomes thin and deeply pigmented. The constant irritation causes loss of sleep so that the patient's general condition suffers.

Accompanying the skin condition there may be high temperature with headache, diarrhœa, retching and vomiting. The tongue is dry, brown and coated and the patient may pass into the "typhoid state" with delirium, etc. In a severe case, in the later stages, the rash may become hæmorrhagic. Lung complications (*e.g.* bronchopneumonia) are common and as a rule fatal. The patient becomes emaciated and bed sores are apt to occur.

The various mucous membranes may become affected and a dangerous intractable diarrhœa may result from inflammation of the ilium and colon. Stomatitis is common, and in about 80 per cent. of cases the kidneys are involved.

There may be hyperkeratosis of the palms and soles, and these are usually the last to desquamate. After desquamation, the skin is at first of a pinkish hue. Convalescence is rather long in most cases.

Fixed arsenical rashes.—These are usually local patches of erythema or urticaria, which tend to relapse and recur in the same place after each injection and to leave pigmentation to a varying extent.

Arsenical melanosis (pigmentation) and hyperkeratosis.—These only occur after prolonged courses of arsenical preparations.

Purpura.—Fortunately these cases are rare; they have been classified as follows:—

1. With simple isolated hæmorrhages from the gums, epistaxis and hæmoptysis.
2. Simple purpura.
3. Purpura rheumatica.
4. Acute purpura hæmorrhagica.

110. Neuritis.—*Paræsthesia.*—During treatment and as a rule after several large doses have been given, some patients complain of a numbness in the hands and feet—a feeling that they have gone to sleep. This feeling is sometimes associated with pruritus and is a warning to cease arsenical treatment.

It is said to be due to a mild neuritis and clears up in a couple of weeks or so if arsenic is withheld and a few doses of sodium thiosulphate given by the mouth—15 grs. doses thrice daily after meals. A typical polyneuritis has also been reported following arsenical treatment.

111. Jaundice.—As jaundice in syphilis may be due to the syphilis itself, to the combined effects of syphilis and its treatment or have no connection with either, the following classification may be made:—

I. Due to syphilis.

1. Early syphilis.

i. Mild jaundice.

Duodenitis, hepatitis, cholangitis, pressure on the common bile duct.

ii. Severe jaundice.

Acute yellow atrophy.

2. Late or chronic syphilis.

Chronic diffuse hepatitis, hepatic gummata, chronic perihepatitis.

II. Due to arsenic.

Producing fatty degeneration—hepatitis, cholangitis.

Producing gastro-enteritis—obstructive jaundice.

III. Due to combined arsenic and syphilis.

Hepatitis, hepatic Herxheimer reaction, hepato-recidive.

IV. Due to neither syphilis nor arsenic.

These need not be considered here.

If the jaundice is due to *T. pallidum*, then active anti-syphilitic treatment is essential; if it is due to a combination of both arsenic and syphilis, this may indicate either cessation of treatment or its energetic continuation, *e.g.* if due to spirochætal hepatitis plus arsenic, then arsenical treatment must cease, whereas, if due to hepatic Herxheimer reaction, or a hepatic recurrence, then treatment must be continued. If due to neither syphilis nor arsenic, then there need be no interference with treatment carefully continued. The differential diagnosis, however, is difficult and is very important, as upon it may rest the ultimate fate of the patient.

In the early stages of syphilis, *e.g.* primary and secondary stages, jaundice is practically always due to syphilis itself, and is usually mild and of sudden onset, and disappears with specific treatment. About 10 per cent. of jaundice cases in the early stages, however, are said to be of the acute yellow atrophy form. Jaundice is said to be particularly likely to occur during the second half of the first year after infection.

In hepatic recidives the jaundice appears several weeks after cessation of treatment.

As the liver is a storehouse of arsenic, in any fatal case of jaundice during treatment in which an excess of arsenic is not found in the bile or liver, it may be assumed that the condition was not due to the arsenic, but some concurrent infection. It has been said that the effects of one or two injections of the organic arsenic compounds are always very slight, and little evidence of hepatic damage may be found at the end of a 6-injection course.

The most striking results were obtained when liver function tests were applied three months after the last injection, when almost invariably hepatic insufficiency was detected, although no clinical signs of hepatic disorder were discovered. Six months after the last injection, all evidence of hepatic insufficiency had gone in cases where three months before it was clearly in evidence.

112. Treatment of Toxic Effects of Arsenic.

Nitritoid crises.

Prophylaxis.—If a vasomotor reaction is expected or feared, the following should be tried:—A drink of glucose solution as a routine; half an hour before the time for arsenical

injection, give a subcutaneous injection of atropine sulphate, gr. 1/50, or just before or during the arsenical injection, give a subcutaneous injection of $\frac{1}{2}$ to 1 c.c. of adrenalin. Alternative methods are—try to desensitize the patient by giving, one hour before the main injection, an intravenous injection of a tenth of the prescribed dose.

Other methods are :—Leave the tourniquet on the arm and inject the whole dose, keeping the tourniquet in position for five minutes or so before releasing it ; or allow the blood to flow into the syringe and mix with the dose, and retain this mixture for from five to fifteen minutes before injecting it into the vein.

Give very slow administration with a pause of five minutes with the needle remaining in the vein before continuing or completing the injection if any reaction is noticed. Give intravenous injections well diluted, especially the first dose.

If dermatoses are feared, it is a good plan to give an intravenous injection of either thiostab or calciostab at the time of the arsenical injection—see below.

Treatment.—Stop injection, if this has not yet been completed. Lay the patient flat on the table if he has been given the injection in the standing or sitting position and loosen his clothing about the head and neck. Give him by mouth 2 drms. of spirit ammon. aromat., in about 1 oz. of water. In mild cases this will be enough.

In more severe cases give the above and, in addition, an immediate intramuscular or subcutaneous injection of adrenalin hydrochloride (1/1,000), 1 c.c. (or 15 minims), and follow in ten minutes, if necessary, by a second injection of 0.5 c.c. (or 7 minims). With the first adrenalin injection may be given one of atropine sulphate, gr. 1/50, or this may be given separately. Injections of pituitrine (1 c.c.) are also said to be of value.

If the patient is comatose, give an intravenous injection of 0.1 c.c. (say 2 minims) of adrenalin well diluted in sterile normal saline (10 c.c. at least) and given very slowly.

For the persistent headaches the following have been recommended :—

Sodium chloride, $15\frac{1}{2}$ grs. in capsules every five to ten minutes, up to 10 doses.

Magnesium sulphate, $1\frac{1}{2}$ oz. every four hours until relief ; watch for signs of dehydration.

Magnesium sulphate, 3 oz. in 6 oz. of water per rectum until relief.

Gastro-intestinal reaction.—Attention to the bowels. Do not give injections, especially intravenous ones, shortly after a meal.

If there is any tendency to develop colic and diarrhœa, give a powder of 10 grs. of each of sodium bicarbonate and bismuth subnitrate, and repeat should any diarrhœa continue.

If there is headache, diarrhœa and vomiting, give an intramuscular injection of adrenalin, $\frac{1}{2}$ c.c.

Protein and colloidal shock.—As these subside in an hour or two, no special treatment is required, merely symptomatic. If fresh, doubly distilled sterile water is used for making up the injections, these reactions will not occur.

Perivascular infiltrations.—Stop the injection if this has not been completed. Take 2 c.c. of a 12 per cent. solution of sodium thiosulphate into a syringe and, inserting the needle into the original needle wound, infiltrate the tissues with the solution. Apply hot fomentations of a saturated solution of magnesium sulphate or 5 per cent. sodium thiosulphate.

Hæmorrhagic encephalitis.—Repeated lumbar puncture, every twelve to eighteen hours, to keep down the pressure, and draining until the flow is at a normal drop rate. Injections of adrenalin or of pituitrine. Intravenous injections of sodium thiosulphate. Intravenous injections of hypertonic saline may also be tried to reduce pressure (20 c.c. of a 30 per cent. solution of sodium chloride). Give oxygen inhalations continuously on the basis of the anoxæmic origin of the condition. Acidosis has also been advanced as a cause of this state, so that gastric lavage may be tried.

Dermal reactions.

Prevention.—Certain warning signs may appear which should never be disregarded :—

1. Itching, especially of the palms and soles, with perhaps some numbness of the fingers.
2. Nervousness and irritability not previously existent.
3. Weakness and malaise.
4. Diarrhœa.
5. Localized erythema and urticaria.

On the appearance of any of these signs, it is well to stop arsenic for a time at least, and to aid its elimination by giving sodium thiosulphate by the mouth or intravenously—according to the severity of the warning. In the meanwhile treatment can be continued with bismuth.

After severe cases of dermatitis, and especially of the exfoliative type, it may be dangerous to resume treatment with arsenic, and all such cases should be referred to the specialist. After less severe cases, after a rest of from one to two months, arsenic may again be given, but if possible, with a different preparation from that which produced the dermatitis, and in small, widely spaced doses, until the effects have been

noted. If no ill effects are seen, the dose may be gradually increased by 0.05 to 0.1 gm. per dose up to those formerly given.

A leucopenia with a reduction of polymorphonuclear neutrophils and an increase of eosinophils and large mononuclears is said to be a bad sign, so that it is a good plan to take a periodic total count and differential white blood cell count.

Radical interference with any septic focus of infection during an attack of acute dermatitis is contra-indicated, owing to the danger of an acute exacerbation with fatal generalization of such infection.

Treatment for milder degrees of dermatoses.—Stop arsenical treatment; give a good saline purge; place on a milk diet; give internally 15 grs. of sodium thiosulphate thrice daily after meals—recently, magnesium thiosulphate has been tried in similar doses with encouraging results. Apply locally:—Lassar's paste (equal parts of zinc oxide, starch powder, lanolin and vaselin), or acid carbolic, calomel, menthol, aa grs. 5, lotio calamine 1 oz.

Later, when the skin is dry and peeling, apply the following ointment twice daily:—Acid carbolic, calomel aa grs. 10, ung. zinci 1 oz.

Treatment for severe cases.—Stop all arsenical treatment. Confine to bed and avoid all chills; keep the bowels well open every day; milk diet; give no meat or eggs; give barley water or plain water to drink *ad lib.*; give a daily warm bath of one of the following:—Bran, 3 to 5 lb., gelatine, 1 to 3 lb., starch, $\frac{1}{2}$ to 1 lb., crushed and made into a cream with cold water, then warm (not hot) water dropped into it so as to wash the cream out of the vessel in which it was made, into the bath.

The above are soothing baths, and when scaling takes place, change the bath into an alkaline one as follows:—Sodium bicarbonate, potassium carbonate, borax aa 3 oz. to the warm bath. After such an alkaline bath, it is necessary to apply an ointment to the skin to counteract its drying effect, so gently anoint with carbolic, calomel and zinc ointment (given above).

The calamine, menthol and carbolic lotion (given above) should be applied several times a day and, if the skin is dry, the following may be applied:—gum tragacanth, 120 grs., olive oil, $3\frac{1}{2}$ oz., and lime water, 5 oz. If œdema is present, local applications of a saturated solution of magnesium sulphate on lint is said to be good.

Treat the eye and mouth conditions as required. If the fusiform bacillæ and spirillæ of Vincent's angina are associated

in the mouth condition, paint the affected parts with N.A.B. in glycerine or Mill's paint; arsenic applied thus has no bad effect on the general condition. Sodium perborate is said to be specific for Vincent's angina, and is applied to the gums, etc., for five minutes as a thick paste in water of the chemically pure salt, followed by a thorough mouth wash with warm water. A solution may be used as a gargle.

Internally, give the thiosulphate of sodium or magnesium. Instead of plain water or barley water, or in addition, imperial drink (acid potassium tartrate, tartaric acid aa 1 oz., sugar, 16 oz., oil of lemon, 12 minims, boiling water, 1 gallon) may be given.

Intravenously give the thiosulphate of sodium in 12 per cent. sterile solution as follows :—

1st day	...	...	0.3 gm.	4th day	...	...	0.9 gm.
2nd "	...	...	0.45 "	5th "	...	...	1.2 "
3rd "	...	...	0.6 "	6th "	...	...	1.8 "

The drug can be procured ready made up in ampoules in crystalline form under the trade name of "Ametox" or, more conveniently, ready dissolved as "Thiostab."

Recently, calcium thiosulphate has been produced and it has been found more efficient in the treatment of arsenical dermatitis than the sodium salt. It can be obtained ready dissolved in ampoules under the trade name of "Calciostab." The adult dose is 0.6 gm. (6 c.c. of Calciostab) daily, intravenously. Care must be exercised in its administration; it should be given to the patient in the prone position and should be injected slowly to minimize as far as possible the sensation of intense cutaneous heat which comes on during or immediately after the injection and passes off in a few minutes. Care must be taken to avoid perivascular infiltration, as sloughing may result.

Intravenous injections of thiosinamin and intramuscular injections of intramin have also been advocated.

Jaundice.

General.—Rest in bed; mild laxatives; full carbohydrate diet with no fats and very little protein; milk and plenty of barley water.

Special.—The special treatment depends on the cause of the jaundice. If this is due to liver infection with the *T. pallidum*, then continue with arsenic treatment. Also continue treatment if the condition is due to liver Herxheimer reaction. If in any doubt whatever as to the cause, stop arsenical treatment and carry on with bismuth, giving at the

same time the treatment laid down above for dermatitis cases, where applicable.

113. Bismuth.—In 1920 Sazerac and Levaditi added bismuth to the syphilologists' armamentarium. Apparently, *per se*, it has no spirochæticidal action, but when combined with a substance called "bismogene," contained in cellular extracts but not in the blood, it forms a new compound, "bismoxyl," which is actively destructive to spirochætes. It is not so potent as salvarsan preparations but is more so than mercury. It is, in many cases, better tolerated than either salvarsan or mercury.

Preparations of bismuth may be classified as follows :—

(a) Suspensions of the metal in isotonic glucose—bismostab, hypoloid bismuth metal, etc.

(b) Aqueous and oily suspensions of insoluble salts of bismuth—quinby, chlorostab, etc.

(c) Oil soluble (lipo-soluble) preparations—stabismol, etc.

Bismuth must always be given by the intramuscular or deep subcutaneous route and special care must be taken to avoid puncture of a blood vessel. It may be given in conjunction with salvarsan and in this case it not only enhances the therapeutic value of the arsenical preparation, but also, in view of its slow rate of absorption, provides a "depot" of drug in the body between injections. The best preparation for this purpose is bismostab.

In cases where for any reason arsenic cannot be given, bismuth may be given alone and the best form in which to give it for this purpose is stabismol, as this preparation is more rapidly absorbed and appears to have a somewhat higher therapeutic value.

In giving bismuth or similar preparations, it is essential to ensure that the bottle is well shaken. The adult dose is 0.1 to 0.2 gm. of metallic bismuth (0.5 to 1 c.c. of bismostab) every five to seven days. The dose of stabismol is 0.5 to 1 c.c. at intervals of two to three days, when given alone. Special fillers for attachment to the syringe for drawing up thick oily products, such as stabismol, can be obtained.

114. Mercury.—Mercury has been used for centuries in the treatment of syphilis and is still a valuable drug, although inferior to arsenic and bismuth. There is a decided advantage in mercurial therapy in that its administration can be continued for long periods. It may be administered in many ways—orally, by inunction, intravenously or intramuscularly.

Oral.—This is the easiest and most convenient method. To prevent gastro-intestinal disturbance, it is best given in

the form of Hutchinson's pill—hydrarg. c cretæ, pulv. ipecac. co. aa grs. 1 ; dose, three to six per day.

Inunction.—This is one of the oldest methods, and if carefully carried out, is a very efficient one. It has the disadvantage that it takes time and that for good results to be obtained, the rubbing must be carried out by a trained mercurial rubber—before the advent of "606," special treatment orderlies in the Army were classified and trained as "mercurial rubbers."

Intravenous.—Soluble salts of mercury are sometimes given intravenously in order to get the patient as quickly as possible under the influence of the drug, but it is doubtful if it has any real clinical value, and moreover it is liable to give rise to intolerance.

Intramuscular.—This is the method of choice in practically every case. Various suspensions of metallic mercury and solutions of soluble salts are used ; the best known and the one most frequently used in the Army is Lambkin's cream, which consists of metallic mercury in a state of fine subdivision suspended in a creocamph base. 10 minims of the cream contain 1 gr. of mercury. It must be warmed before use and well stirred to ensure even distribution of the mercury.

115. Intolerance of Bismuth and Mercury.—Fatal results have followed the accidental intravenous injection of bismuth preparations, with symptoms of dizziness, pallor, rapid, weak pulse, dyspnœa, convulsions, collapse and death.

Many minor toxic effects have been reported, but the most important ones are :—

- (a) Blue line on the gums.
- (b) Stomatitis.
- (c) Gastro-intestinal disturbance.
- (d) Nephritis and albuminuria.
- (e) General malaise and loss of weight.

Blue line and stomatitis.—During the administration of bismuth and mercury, strict attention to oral hygiene is essential. Patients should have a careful mouth inspection at least once a week, and if commencing gingivitis is discovered, treatment should be suspended for a time. In mild cases with only the blue line present, a gargle of the following will usually be found sufficient, plus strict oral hygiene :—

R Potass. chlorat.	...	...	...	3 drs.
Alum. sulphat....	...	...	...	2 "
Glycerin. of ac. boric.	...	...	...	3 "
Aquam ad	...	...	...	8 oz.

Half an ounce in a glass of water to be used as a gargle several times a day.

Where gingivitis or stomatitis has developed, paint the affected parts with Mill's paint :

R	Liq. arsenicalis	...	...	...	} aa 1 part
	Vin. ipecac.	...	...	...
	Spir. vini. rect.	...	...	...
					... 2 parts

If Vincent's angina is present, treat with sodium perborate (*see* arsenical stomatitis). Give sodium thiosulphate intravenously.

In all cases under specific treatment the services of the dental officer should be requisitioned if the condition of the mouth warrants it.

Gastro-intestinal disturbances.—Bismuth rarely gives rise to disorders of this nature but mercury occasionally does, especially when administered orally. Diarrhœa is the commonest symptom and it usually clears up on cessation of treatment.

Nephritis.—Bismuth and mercury, especially the latter, may give rise to nephritis and consequent albuminuria, sometimes severe. If, therefore, albuminuria is discovered during routine urine examinations, these drugs should be discontinued.

Malaise, loss of weight and neuritis.—These reactions are usually the result of long continued treatment leading to cumulative effects. If they occur, it is best to withhold specific therapy for a while and to give tonics such as iron and strychnine.

Contra-indications—bismuth and mercury.—Pulmonary tuberculosis, and the following, when not due to syphilis : Advanced diseases of the heart or nervous system, nephritis, severe diabetes, cachectic conditions.

Caution is indicated where septic foci are present or where a patient is predisposed to any of the following conditions : eczema, erythema, hæmophilia, urticaria.

116. Iodides.—The preparations of iodine have not the same place in the treatment of syphilis as have arsenic, bismuth and mercury. Their reaction is that of dissolving newly formed fibrous tissue and exposing the spirochætes to the action of specific remedies. Potassium iodide in doses of 10 to 20 grs. three times daily after food in about 1½ oz. of water is usually given. The main symptoms of intolerance are : headaches, nasal catarrh, watering at the eyes, dyspepsia and occasional dermatoses. These effects may be avoided in most cases by giving the drug well diluted and in an alkaline

solution, but occasionally a patient is found who has an idiosyncrasy for iodides.

If toxic symptoms appear they usually disappear on discontinuance of the drug, but, if it is necessary to continue, the French codex tincture in keratin-coated capsules will obviate it. In intractable cases cure may often be effected by intravenous administration of normal saline.

117. Choice of Drugs and Courses of Treatment.—

Whilst every case must be treated on its merits, many courses of treatment have been devised from time to time. Recently the Health Organization of the League of Nations published in its quarterly "Bulletin" (Vol. iv, No. 1, March, 1935) the results of an inquiry into syphilis treatment carried out in five countries (Denmark, France, Germany, Great Britain, United States of America). The recommendations by the committee of experts were, in effect, (a) the necessity for early diagnosis; (b) the importance of careful clinical physical examination before the beginning of treatment; (c) the necessity for strict supervision of the patient during treatment; (d) serological and clinical observation for a long period after treatment has been completed; (e) adequate examination of the cerebrospinal fluid before dismissal from observation.

Whilst all are agreed that it is necessary to employ a comparatively heavy individual dosage of the arsenobenzene and of the bismuth or mercurial compounds, the doses being administered in comparatively rapid succession, especially at the start, opinions differ as to whether intermittent or continuous treatment is the best or whether it is advisable to give bismuth or mercury concurrently with the arsenicals or to wait until a number of arsenicals have been given.

As a result of very careful analysis of many thousands of cases, certain courses of treatment have been devised for general use in the Army. These courses have been in general use for a considerable period and have proved of great value and, in spite of other courses recommended in civilian practice, the Army procedure is still recommended for general adoption.

It must, however, be remembered that they are only put forward as a guide for a man of average weight, and not to be taken as a cast-iron rule of thumb.

It is essential that whatever course is followed should go through without breaks, as it has been found that it is those cases which have received irregular treatment which tend to relapse and to get late nervous symptoms. There is, moreover, little fear of severe toxic reactions with the courses recommended.

Early primary cases.

Course " A "		
Day of treatment.	Intramuscular injection of sulphostab., gm.	Intramuscular injection of bismostab., c.c.
1st	Blood to be taken for Wassermann reaction.	
	0.45	1.25
8th	0.45	1.25
15th	0.45	1.25
22nd	Rest	
29th	0.6	1.25
36th	0.6	1.25
43rd	Rest	
50th	0.6	1.25
57th	0.6	1.25
64th	Blood to be taken for Wassermann reaction.	
65th to 84th	Rest of four weeks from last injection.	
85th to 95th	Fourteen days' treatment with potassium iodide.	
99th to 155th	Repeat course as far as the 57th day.	
162nd	Blood to be taken for Wassermann reaction.	
	Also cerebrospinal fluid, if considered necessary.	

Note.—Some medical officers advocate the giving of sulphur in the form of intramuscular injections of intramine, 3 c.c., on the 22nd and 43rd days—during the rest intervals. This procedure is adopted with a view to minimizing the chances of toxic effects.

In the above course, it will be seen that there are two series of injections, making a total in all of fourteen and that the total amount of sulphostab given is 7.5 gms. and of bismuth 3.5 gms.

Period of observation.—Subsequent procedure should be as follows :

(a) If the blood is negative and the cerebrospinal fluid, if examined, is also negative, no further treatment should be given. The patient should attend for observation once a quarter for the first year and once every six months for the second year after cessation of treatment. At each attendance his blood should be tested by Wassermann, etc., reaction. If considered necessary, the patient should be ordered to attend once every month for the first year.

A provocative injection of one of the arsenical preparations should be given a week before the last Wassermann test of each year of observation.

Before the patient is finally struck off treatment for syphilis, a complete examination of the cerebrospinal fluid should be

made. If arrangements for the removal of the fluid cannot be satisfactorily made at the man's station, he should be sent to the venereal centre of the district or area in which he is serving.

(b) If on the 162nd day, or any subsequent time during the period of observation detailed under (a) above, clinical or serological indications for further treatment are present, Course "B" (see below) should be given. It should first be ensured that a minimum period of six weeks' rest has been allowed since the completion of the previous course of arsenical and bismuth or mercurial treatment.

118. Medium and Late Primary and Secondary Cases.—In the medium primary cases, Course "A" is usually sufficient, especially if the Wassermann reaction rapidly becomes negative again, as happens as a general rule.

Course "B"

In late primary and secondary cases :

1st to 162nd day	...	Treatment as in Course "A."
163rd to 205th day	...	Six weeks' rest.
206th to 219th day	...	Fourteen days' treatment with potassium iodide.
220th to 374th day	...	Repeat Course "A."

Period of observation.—Subsequent procedure should be as follows :

(a) If the blood is negative and the cerebrospinal fluid, if examined, is also negative to all tests, no further treatment should be given. The patient should attend for examination and blood test every three months for the first year and once every six months for the second year after cessation of treatment. If considered necessary, the patient should be ordered to attend monthly for the first year. The tests at the end of each year should be preceded by a provocative injection of one of the arsenical compounds, as stated in Course "A."

(b) If on the 374th day, or any subsequent time during the period of observation, serological indications for further treatment are present, a period of three months' rest from the date of the last injection should be allowed, and then the following course should be given :

Day of treatment.	<i>Short course</i>	
	Intramuscular injection of sulphostab., gm.	Intramuscular injection of bismostab., c.c.
1st	0.45	1.25
8th	0.45	1.25
15th	0.45	1.25
22nd	Rest	
29th	0.6	1.25
36th	0.6	1.25

These short courses may be repeated at intervals of three to six months until the blood and cerebrospinal fluid become negative (*see* also "Wassermann fast" cases below).

119. Tertiary Cases.—It is not possible to lay down a definite course of treatment for cases of tertiary syphilis. It must be clearly understood that such cases must be treated individually according to their symptoms, age of infection, etc. The following procedure has been recommended and should be used as a guide for the treatment of such cases :

1. Provided that there are no signs of involvement of the nervous system, Course "A" may be given up to the 162nd day.
2. Ten weeks' rest.
3. Fourteen days' treatment with pot. iod.
4. A short course.
5. Fourteen days' treatment with pot. iod.
6. Twelve weeks' rest.
7. A short course.

Treatment should be carried on on these lines for at least two years, even if the Wassermann reaction becomes negative earlier.

Tests of the cerebrospinal fluid should be carried out as for primary and secondary cases.

A number of cases occur in which there is no clinical evidence of syphilis but in which the blood has been examined for some reason—*e.g.* as blood donors, etc.—and has been found to be positive. These cases may be given the course recommended above for tertiary cases but some appear to do better if the original Course "A" is omitted and a series of short courses only is given.

120. In certain tertiary cases, especially those with little or no clinical evidence of the disease, the Wassermann reaction remains persistently positive in spite of treatment. These cases have been known as "Wassermann fast" and opinion is divided as to whether treatment should be continued indefinitely or not. In general it may be stated that as a positive Wassermann reaction denotes the presence of disease, every effort should be made to render it negative.

A change in drugs often causes a favourable reaction in the patient—novarsenobenzol instead of sulphostab and mercury instead of bismuth. Recently, whole blood injections (auto-hæmotherapy) given in the rest intervals have been found beneficial. Another method which shows promise of being a distinct advance is to take up the dose of arsenical preparation into a syringe and then draw up about 8 c.c. of the patient's own blood from a vein into the same syringe and mix it with the drug. This mixture is then injected intramuscularly, after a short interval.

121. The presence of albuminuria is not a contra-indication but rather an indication for cautious treatment. It may be due to (a) concurrent renal disease, (b) renal syphilis, or (c) the effects of treatment. Syphilis always attacks a damaged tissue and will therefore inevitably cause further serious harm to an already weakened organ if left untreated.

In such cases treatment should be with arsenical preparations only as mercury and, to a less extent, bismuth are contra-indicated. Small doses (0·15, 0·3 grm., etc.) should be given at first and the kidney efficiency determined by urea concentration tests, etc., before and after treatment, to decide prognosis. In renal syphilis enormous quantities of albumin may be present in the urine which tend to disappear after appropriate treatment, leaving little or no residual permanent damage if taken early.

122. Cardiovascular Syphilis.—In treatment of syphilis of the cardiovascular system, great care must be exercised to avoid a Herxheimer reaction, which may in such cases prove fatal. Furthermore, in some circumstances, a temporary general improvement may be followed by aggravation of the heart condition or by heart failure ("therapeutic paradox"). This has been attributed to the weakening effect of rapid resolution of syphilitic inflammation in the aorta and valves.

It is well, therefore, to begin such cases with a course of mercury and iodides. If the mercury is given orally, Hutchinson's pill (℞ hydrarg. c. cretæ, pulv. ipecac. co, aa grs. 1) twice daily is a convenient form, or the mercury and iodides may be combined in the following mixture :

℞	Liq. hydrarg. perchlor.	...	...	...	drs. 1
	Pot. iod.	...	...	...	grs. 10
	Spt. chloroform	...	...	...	mm. 5
	Infus. gent. co.	...	...	ad	oz. 1

Oz. 1 twice or, if well tolerated, thrice daily.

The course of mercury and iodides should be given for a period of two months and, if the patient is free from symptoms, may be followed by arsenicals, but great care must be exercised and the initial doses must be small (*e.g.* 0·15, etc.). Arsenic must be stopped immediately if there are any signs of intolerance or if it appears to react unfavourably on the heart condition.

In cases where arsenic is contra-indicated and in certain cases in which it is not advisable to give mercury, bismuth may be given. Good results have been obtained by giving stabismol intramuscularly in doses of 1 c.c. bi-weekly for eight doses, with a rest of one month between courses.

In all cases of cardiovascular syphilis rest is of paramount importance and the patient should be kept strictly in bed at least for the first six weeks of treatment.

123. Syphilis of the Nervous System.—In all cases of syphilis of the nervous system it is best as a rule to begin with a course of bismuth alone. In some cases of neurosyphilis, and especially cases of chronic syphilitic meningitis with persistent headache, the results have been brilliant and frequently better than with arsenic and mercury. In *tabes dorsalis* the pains are usually promptly relieved by a few injections.

Stabismol is a good drug for this purpose and should be given intramuscularly in doses of 0.5 to 1 c.c. twice weekly at two to three days' intervals for three weeks, followed by a fortnight's rest, in which period *pot. iod.* is administered. At the end of the rest period a further course of bismuth is given which is followed by a rest of one month.

Subsequent treatment depends on the type of case. In those with eye involvement in which tryparsamide may be dangerous, silbersalvarsan, given intravenously, has been found a good drug. It can be given in the form of Course "A" in conjunction with bismostab and may be followed by a series of short courses. As a general rule one should begin with small doses of arsenical preparations and give more prolonged treatment with arsenic, mercury and bismuth than is usually considered necessary for ordinary cases of syphilis.

In cases of meningovascular syphilis, tryparsamide treatment should follow the course of bismuth. The following is a suggested course (before treatment is begun and again after the second and third injections, the eyes should be carefully examined) :

Day of treatment	Intravenous injection of tryparsamide, gms.	Intramuscular injection of bismostab., c.c.
1st	3	—
4th	—	1
8th	3	—
11th	—	1
15th	3	—
18th	—	1
22nd	3	—
25th	—	1
29th	Rest	
32nd	Examination of cerebrospinal fluid.	
36th to 60th	Repeat as for 1st to 25th days.	

The drug appears to agree so well with the large percentage of patients that it can be given in successive courses with a month's interval between each.

It is usually necessary to continue treatment with a course of one of the salvarsan compounds after stopping the tryparsamide.

In parasyphilis the course of bismuth should be followed by pyrexial treatment. Various methods have been devised—intravenous injection of T.A.B. vaccine or Dmelcos vaccine, intramuscular injection of sulphosin, Leo (a 1 per cent. emulsion of sulphur in sterile olive oil) or malaria inoculation. The pyrexial treatment should be followed by a course or courses of arsenicals and bismuth.

In all cases of syphilis of the nervous system the specialist should be consulted before commencing treatment. In all cases also potassium iodide should be given before and in the rest intervals during treatment.

Intrathecal administration of arsenical preparations and of salvarsanized serum and drainage of the cerebrospinal fluid immediately after treatment have been advocated but are not recommended.

124. Congenital Syphilis.—Treatment should be begun as soon as the condition is diagnosed and may start immediately after birth. Either arsenic, bismuth or mercury may be administered within an hour or two of birth with beneficial effect. The amount will vary with the age of the child, the weight of the child and the clinical condition present. As a rule a course of combined arsenic and bismuth should be given.

It is difficult to detect intolerance in very young children and the best indication is the general health of the child and the increase in weight from week to week.

The average starting dose of sulphostab during the first year of life is 0.005 gm.—less for a marasmic infant—increasing to 0.075 gm.

It is best to give the injections bi-weekly for the first two or three weeks and then weekly. Three courses in each year for two consecutive years should be given. A course consists of one injection a week for six weeks. The average dose of bismuth is 0.025 gm. at each injection.

CHAPTER V

SOFT SORE

125. The term "soft sore" or "chancroid" is now commonly applied to any sore on the genitals which is non-syphilitic, but at one time it was limited to those sores caused by Ducrey's strepto-bacillus.

The true chancroid is said to begin with a papule after an incubation period of, as a rule, from one to three days. The papule rapidly breaks down and ulcerates. The ulcer extends fairly rapidly, so that, where there are multiple sores, these may coalesce; is very contagious, so that contact sores are common; is painful and irregularly shaped, with thin, red, undermined edges. Bubo formation is common.

Chancroid is a local disease and no constitutional symptoms follow, and an abrasion of the skin or mucous membrane is necessary for infection.

Five forms of soft sore have been described :

(1) *Ulcus molle*.—The sores are usually multiple, and occur on the genitals, but may be found on any part of the body. The circumference of the ulcer is sharply circumscribed but irregular in outline, the edge is undermined and the ulcer is surrounded by a marked inflammatory ring. A bubo is common, but may not appear for weeks, or even months, after the sore has healed.

(2) *Ulcus molle elevatum*.—The sore is raised above the surface and the edge is not undermined; it is often single and, owing to pseudo-induration, is very liable to be mistaken for a chancre, especially as there is a long incubation period.

(3) *Ulcus molle miliare*.—Each lesion is a raised papule in the centre of which is a crateriform ulcer. They occur in great numbers and persist for some time. At first sight they look like a hair follicle infection. The sores give rise to a great deal of discharge and are generally painful.

(4) *Ulcus molle phagedenicum*.—Phagedenic ulcers cause deep destruction of the penile tissues and are generally found under a tight foreskin. The fusiform bacillus and spirochæte which exist in symbiosis with it, organisms which appear to be the cause of Vincent's angina and balanitis gangrenosa, are usually to be found.

(5) *Ulcus molle serpiginosum*.—The primary lesion is a furuncle, the edges of which become blue, bluish-white, and then break down until a distinct ulcer is formed. The base of the ulcer is fleshy, uneven and secretes freely. The edges are ragged and are deeply undermined; the overhanging portion is œdematous and bluish-white in colour; external to this the colour becomes purplish, and still further out and spreading for some distance into the healthy tissue one sees the red colour of inflammation. This type of ulcer is very chronic and is seldom diagnosed correctly, and unless exactly the right treatment is given curative measures are of no avail. It appears to occur chiefly amongst those who have served in the tropics.

Diagnosis.—The local infection is commonly due to a diphtheroid organism and occasionally to the bacillus of Ducrey, but in view of the excellent results obtained by treatment with a vaccine of Ducrey's bacillus, it would appear that this latter organism is more often the underlying causative agent than was previously supposed.

The ulcer is distinguished by its irregular, overhanging edges, excavation with definite loss of tissue, absence of infiltration of tissues external to the sore, tenderness, purulent discharge, acute adenitis frequently going on to bubo formation and the absence of *T. pallidum*.

A soft chancre is locally infective, that is, if the pus from the sore is rubbed into a scratch elsewhere a fresh chancroid is produced. A hard chancre is not inoculable after about fourteen days from its appearance. However, it is possible that a double infection exists, the chancroid becoming indurated some weeks after the appearance of the sore. The last three dates on which risk of infection took place should be elicited from the patient as the disease may be syphilitic from the beginning. Infection may have occurred three weeks or a month previously and not on the date given as the occasion on which the patient thinks he was infected, which was perhaps only four days before the appearance of the sore. The essential point is to ascertain as soon as possible whether the lesion is syphilitic or not.

If antiseptics have been used normal saline lotion should be applied for three days. Then scrape the edge of the sore after thoroughly cleansing the surface with saline and examine the exuded serum by the method described under syphilis. Also examine a smear stained by Gram's method.

Ducrey's bacillus occurs as minute, oval rods, 1·5 micron by 0·5 micron, and is found mixed with other organisms in the purulent discharge from the surface of the sore and in the granulation tissue at the edge; they are arranged in small

groups or short chains. A few may be found in the leucocytes. The bacillus is Gram-negative and shows bipolar staining. The diphtheroid bacilli may be found irregularly situated in the slide and are stained by any of the ordinary stains; they show polar staining but are Gram-positive.

126. Treatment.—As the diagnosis of chancroid is made by excluding infection of the sore by *T. pallidum* no anti-septic applications should be made for the first three or four days, unless *T. pallidum* has already been found.

If the sore is seen in the early stages give a thorough washing up with a sterile, saline solution containing 5 per cent. (*i.e.* 437½ grs. to 20 oz. water) sodium chloride and 1 per cent. (*i.e.* 87½ grs. to 20 oz. water) sodium citrate. Then apply a compress soaked in the same solution. In applying these dressings, use enough cotton wool to absorb the exudate, and bandage lightly. Redress every four hours until healing begins.

Where an irregular, deep-seated ulcer already exists, however, better results will be obtained by giving a continuous irrigation for 20 to 30 minutes, or a local bath (if the sore is in such a situation as to allow this) for the same period. In both cases the saline solution given above should be used, and as hot as the patient can stand. After the irrigation or bath, dress lightly as above with gauze soaked in saline solution. Repeat every four hours until healing begins.

After the necessary scrapings have been taken to exclude syphilis, one of the following dressings may be applied:

(a) Gauze soaked in a saturated solution of glucose containing sufficient carbolic acid to give a strength of 1 in 80, with a layer of cotton wool just enough to absorb the discharge and no more. If a bandage is necessary apply very lightly, and redress as soon as the discharge appears on the surface of the wool or bandage.

(b) If the sore becomes indolent apply dressings soaked in a 40 per cent. solution of glucose with 2 per cent. zinc sulphate.

(c) Good results have also been obtained by dressing with compresses of urotropine, dr. 1 to oz. 1.

(d) Strong antiseptic lotions are not required in the majority of cases, in fact in phagedenic cases only the mildest warm antiseptics should be used. However, eusol, chloramin, perchloride of mercury (1/10,000), oxycyanide of mercury (1/8,000), mercurochrome (2 per cent.), etc., are of value.

Sloughing cases do well if swabbed with camphenol (equal parts of camphor and acid carbolic crystals rubbed up in a mortar).

In phagedena toxins must be washed away as soon as formed, and so the antiseptic should be used continuously, and even a hip bath may be necessary. Weak chlorine ionisation once a day will often stop the disease after one to two applications. As one of the essentials in treating this condition is free access of oxygen, there must be no hesitation in slitting up the foreskin in those cases in which there is the slightest degree of phimosis, where the sore is subpreputial.

Once the sore has become "clean" such applications as tr. benzoin co. or silver nitrate 2 parts, balsam of Peru 20 parts, vaseline up to 100 parts, or 5 per cent. fuchsin ointment in vaseline may be tried. When the sore is granulating application of scarlet red ointment for one or two days hastens healing.

Good results with a 50 per cent. reduction in the period of stay in hospital and of convalescence are reported from intravenous injections of tartar emetic in 1 per cent. solution given from the beginning. Antimony may with advantage be given in the form of urea stibamine or neostibamine. In giving tartar emetic the initial dose should be 3 c.c. increasing by 1 c.c. at each succeeding injection up to 10 c.c. at four-day intervals.

Vaccines of the diphtheroid bacillus may be used. They may be killed with carbolic 1 per cent. for five days or by heating to 60° C. for half an hour. The dosage varies from a primary dose of 20 million up to 1,000 million, vaccination being performed every three or four days. The reaction both at the seat of injection and at the sore is marked and healing begins soon. Secondary organisms may often with advantage be added to the vaccine. All types of soft chancre react to this vaccine.

Nicolle and Durand have prepared a vaccine of Ducrey's bacillus which gave good results and, more recently, a vaccine of this nature has been introduced under the trade name of "Dmelcos." This is stated to be an emulsion of Ducrey's bacillus prepared to ensure low toxicity and standardized to contain 225 million organisms per c.c. It is given intravenously at three to four-day intervals; the initial dose being 1 c.c. increasing by 0.5 c.c. to a maximum of 3 c.c. Striking results have been obtained in all types of cases of sores and buboes. Where obtainable, this vaccine should be used in all cases.

Riensterna prepared an antiserum by inoculating sheep and favourable results have been claimed for this.

127. Buboes.—A bubo forms usually on the same side of the body as that on which the sore is situated, but not necessarily so. Lesions on the frænum may cause bilateral

buboes. It is stated that sores on the frænum, glans and prepuce are followed by a larger percentage of buboes than lesions on other parts of the genitals. The predisposing factor is lack of drainage from the causal sore.

Treatment.—If seen early thorough cleanliness and thorough drainage of the sore, with rest in bed and a course of saline purges, may abort the bubo. Evaporating lotions may be applied locally in addition, or half-minute daily applications of ethyl chloride spray. Injections into the gland plus hot fomentations have been tried with a view to aborting the bubo—*e.g.* 10 to 20 minims of a 3 per cent. solution of ac. carbol., 10 to 20 minims of a 1 per cent. solution of benzoate of mercury, or 20 minims of a 1 per cent. solution of sodium arsenate. These may be repeated every two days if necessary.

Intramuscular injections of sterile milk (aolan) and whole blood injections have been tried with some success.

Dmelcos vaccine should be given.

If pus has formed in the gland, apply hot fomentations and try one of the following :

(a) Aspirate with a syringe with good suction, then inject 10 per cent. iodoform in vaseline. (Melt in a water bath and inject just before the vaseline begins to solidify). Express the vaseline in three days and if there is any pus still present repeat the process.

(b) Aspirate and inject 1/20 solution of tr. iod. in water, then aspirate the iodine solution. Repeat the injection with 1 to 2 c.c. of the solution and seal up with collodion. Apply a pad. If the cavity refills, repeat daily. After the second or third day the intervals can be lengthened.

(c) Aspirate and inject 10 per cent. iodoform in glycerine. Empty and refill the cavity and leave some of the emulsion in at the last refill. Apply hot compresses. If pus accumulates repeat the process.

Whereas aspiration methods described above do not always effect a cure, buboes which have been so treated previously tend to heal much quicker when subsequently incised than those which have not been aspirated.

128. Climatic Bubo.—This condition, which is identical with lymphogranuloma inguinale of temperate climes, occurs in cases in which the initial sore is either absent or evanescent. It is apparently due to a filtrable virus and serum of convalescent patients is protective.

At first there is usually rubbery indurated enlargement of the inguinal glands ; the swelling is not particularly painful and there may be little tenderness. Although there is not as a rule a true sore, there may be a slight frænal tear, small

papule, herpetiform patch, abrasion, etc. A venereal history can usually be obtained after some difficulty. As a rule there are no constitutional symptoms, but there may be irregular fever, mild leucopenia and occasional splenic enlargement.

The condition may remain stationary for weeks or months and then resolve, but it is usual for it to go on to suppuration.

The ultimate prognosis is good.

Treatment.—In the early stages it was formerly the practice to excise the glands, but it was found that primary union was by no means always attained and the infection spread to deeper glands and to surrounding tissues and, further, that troublesome œdema of the legs followed if the glands were too radically dealt with. Surgical interference with cleaning up or drainage should, therefore, be avoided.

Gland puncture and aspiration often has a very beneficial result. In cases which have broken down, dressing with B.I.P.P. is best.

General treatment consists in protein shock therapy, either by means of T.A.B. vaccine given intravenously (75 to 150 million at intervals of four days and well diluted) or, better still, with Dmelcos vaccine. Good results have been obtained by pushing pot. iod. by the mouth or giving collosol iodine intravenously.

Recently treatment by means of injections of serum from convalescents and by intravenous injection of pus antigen has been tried with encouraging results.

129. Herpes Genitalis.—This appears as crops of tiny vesicles pin-head in size, often in clusters which tend to coalesce to form larger lesions. The condition is seldom seen until the vesicles have ruptured, leaving tiny, shallow, punched-out erosions or ulcers whose margins are composed of arcs of many small circles, an appearance which is typical. With a magnifying glass one can see the frayed edges of the ruptured vesicles as concentric circles round the borders of the shallow ulcers—this is pathognomonic of herpes. The crops tend to appear and to disappear and are sometimes preceded by local itching or mild neuralgic pains in the part. There may be an accompanying inguinal adenitis.

Treatment.—This condition is very liable to relapse. Lumbar puncture with the withdrawal of 10 c.c. of fluid often effects a cure. Local treatment consists in keeping the parts scrupulously clean and dry. Lycopodium powder, after washing and drying, is to be recommended. Painting with silver nitrate, 10 grs. to the oz., may be tried in obstinate cases. If there is much tenderness or pain apply the following: cocaine hydrochlor., 12 grs., menthol, 1 gr., lanolin, 4 drs.

APPENDIX I

LIST OF ARMY FORMS, ETC., USED FOR
PATIENTS IN VENEREAL DIVISIONS

Army Form B 178	...	...	Medical History Sheet.
„ „ B 256	...	...	Morning Sick Report.
„ „ B 181	...	...	Clinical Temperature Chart.
„ „ F 734	...	...	Diet and Extra Summary.
„ „ I 1202	...	...	Hospital Diet and Extra Sheet.
„ „ I 1220	...	...	Hospital Case Card.
„ „ I 1237	...	...	Medical Case Sheet.
„ „ I 1239	...	...	Surveillance Report.
„ „ I 1242	...	...	Instructions to Syphilis Patients.
„ „ I 1243	...	...	Instructions to Gonorrhœa Patients.
„ „ I 1245	...	...	Lavage Room, Nominal Roll of patients irrigating daily.
„ „ I 1247	...	...	Venereal Case Card.
„ „ I 3212	...	...	Laboratory Report on Tests.
„ „ O 1643	...	...	Hospital Notification to the Regimental Paymaster.
„ „ O 1644	...	...	Notification of Venereal Cases to Os.C. Units.
Ministry of Health Form V 15			Confidential Card for Civil Clinics (on discharge from the Army).
Army Book 27	...	...	Admission and Discharge Book.
„ „ 172	...	...	Medical Transfer Certificate.
Royal Air Force Form 39	...	...	Medical History and Case Card.
„ „ „ 48	...	...	Envelope Cover for Documents.

APPENDIX II

MODIFICATION OF PROCEDURE IN INDIA

1. Quarterly venereal report—I.A.F. (Medical) 7.—

This report will be compiled in triplicate by the A.D.M.S., district or independent brigade area, from Table VII of A.F. A 31. The remarks of the district or independent brigade area commander having been obtained, two copies will be forwarded by 15th of the month following the period under review to the D.D.M.S. of the command. The latter, having obtained the remarks of the G.O.C.-in-C., will forward one copy to the D.M.S., India.

2. Venereal case card—A.F. I 1247.—In the case of syphilis, this card will be made out in duplicate for each case, and the necessary entries will be made under the appropriate headings. On completion of the course, the original case card will be sent to the specialist in dermatology concerned for perusal and for remarks when necessary.

On completion of treatment, *i.e.* when the soldier is finally struck off the syphilis register, or on transfer, the original card will be placed with the man's medical history sheet and the duplicate forwarded to the D.M.S., India.

On transfer of a temporary nature, *i.e.* to the hills during the hot weather, musketry courses, etc., where the soldier will return to his original station, the duplicate copy will not be forwarded as above, but will be retained pending the man's return.

When a case is sent to another hospital as a transfer, the original card accompanying the medical history sheet will be marked with a " T " in red ink, and on its being received at the hospital, a duplicate card will be made out and disposed of eventually as above, so that the system will continue.

The date and cause of a soldier being struck off the syphilis register (*i.e.* recovered, transferred to the reserve or discharged from the army, etc.) will be entered on the venereal case card in red ink. If relapse should occur at a later date and the venereal case card is not available, information to that effect will be sent to the D.M.S. in India, giving the station and date on which the soldier was struck off the syphilis register. A copy of the venereal case card will then be forwarded to the station at which the soldier is serving.

In the case of soft chancre, N.Y.D., venereal sore and gonorrhœa, A.F. I 1247 will be made out in original, only, and will be sent to the D.M.S. in India within four months of the final discharge of the case from hospital. The card will be sent with the case on transfer to another hospital, or on transfer from one station to another within four months of discharge from hospital. The purpose of the retention of the cards for a period of four months is to enable a complete record of the case to be made. Records (with the results of the inspections) of attendances for inspection after discharge from hospital will be entered on the cards before their final disposal.

3. Report on venereal disease contracted—I.A.F. M 1226.—(Routine on admission of a case of venereal disease to hospital.)

(1) On the admission of a man suffering from venereal disease, I.A.F. M 1226 is made out in triplicate and distributed as follows :

(a) One copy is sent to the O.C. the man's unit.

(b) The second copy is kept in the venereal division of the military hospital.

(c) The third copy is sent to the cantonment hospital.

(2) If the patient is unable to identify the woman, he will be taken to the cantonment hospital, from which he will be accompanied by the assistant medical officer, cantonment hospital, to the house in which the woman lives. If identified, the woman will be expelled from the cantonments in accordance with the Cantonment Act.

(3) In the event of identification, a report should be made by the officer in charge of the cantonment hospital to the O.C. military hospital, stating the result of any action under para. 2 above.

(4) In addition to entries in the venereal case card, etc., the case is also entered in the "Daily Register of Venereal Diseases, by Corps—I.A.F. M 1228."

4. Specialist in dermatology.—The specialist in dermatology will :

(a) Periodically visit the venereal wards of each military hospital (British and Indian) in the district, and will be responsible for supervising the treatment of venereal diseases in conformity with instructions issued from time to time.

(b) Bring to the notice of the O.C. hospital any case in which methods of treatment might, with benefit to the patient, be improved or altered, and will especially point out any instance of laxity with regard to the beginning of treatment.

(c) Obtain each month from the office of the A.D.M.S.

the statistics, on I.A.F. M 1228, of venereal diseases in each station in the district, and bring to the notice of the A.D.M.S. any points of interest regarding these statistics, and, in compliance with instructions received, investigate and report on causes of any marked increase in disease.

(d) Be available to give advice on questions of venereal or skin diseases in all British and Indian military hospitals.

(e) Arrange for the instruction and training of non-commissioned officers and men of the R.A.M.C. for qualifications as special treatment orderlies where required.

(f) As facilities occur, train officers of the R.A.M.C. and I.M.S. in the principles of diagnosis and treatment.

(g) Advise Os.C. units on the organization and equipment of prophylactic treatment rooms.

5. Time expired British troops.—*Venereal disease.*—

(1) Soldiers suffering from venereal disease, when due for discharge from the service or transfer to the reserve, will be evacuated to the United Kingdom and not retained in India until they require no further treatment in hospital.

(2) These men will be despatched as sick transfers to the United Kingdom on dates which will least interfere with their continuous treatment, full particulars of which will be transmitted by the O.C. the British military hospital concerned to the port of embarkation, to be handed over to the S.M.O. of the transport on which the cases are embarked.

(3) Os.C. British military hospitals will ensure :

(a) That all ranks for transfer to the United Kingdom for discharge from the service or for transfer to the reserve who are suffering from V.D., and especially those on the syphilis register, on being disposed of under the above instructions, are accurately accounted for as struck off local treatment and registers.

(b) That these transfers, when possible, accompany parties of units to which they belong proceeding to the port of embarkation, unless the condition of the disease renders that course inexpedient or impracticable, *e.g.* when transfer under any circumstances would be detrimental to recovery or to the comfort of the patient, arrangements should be made for the dispatch of the case on any suitable date during the trooping season ; when transfer will not be detrimental or adequate medical supervision is available during transit, definite instructions should be issued for the care of the case, and sufficient suitable dressings for the journey will be provided by the O.C. British military hospital transferring the case.

(c) That the original case cards and the medical history sheets are fully completed and attached to the transfer

certificate (A.B. 172), which will be forwarded to the E.M.O. at the port of embarkation for transmission to the S.M.O. of the transport on which the man embarks. To allow of adequate arrangements being made for separate messes, a nominal roll and medical papers of such venereal cases will be sent under confidential cover to the Movement Control Officer to reach him three clear days before the date of embarkation.

(d) That men attending hospital for V.D. on the syphilis register or in any respect under observation as unrecovered from these diseases are dealt with as above as sick transfers. Men not in hospital will not be readmitted at the station before departure, but their medical documents will be completed up to date as in (c) above and transmitted as in the case of a patient in hospital.

(e) That the names of any men in hospital for V.D. or attending as in (d) above who are to be sent to the United Kingdom are obtained forthwith and periodically throughout the troop-ing season from units of the station.

(4) Duplicate case cards (A.F. I 1247) of all cases of syphilis will be fully completed and forwarded to the D.M.S. in India, A.H.Q., Simla.

(5) The object of the above procedure is to ensure that every man transferred to the United Kingdom for service reasons (*i.e.* other than an invalid) who is suffering from V.D. shall be kept under continuous medical supervision (and treatment when necessary), and that all such men shall come under the notice of the authorities in the United Kingdom who are concerned with the carrying out of discharges and transfers to the reserve.

This will enable arrangements to be made for continuity of treatment after discharge or transfer to the reserve, in accordance with Regulations for the Medical Services of the Army, 1932, para. 179, and will prevent infected men being passed unobserved into civil life.

APPENDIX III

THE MANAGEMENT OF PREVENTIVE
ABLUTION ROOMS

1. It has been found that one central room is, as a rule, more satisfactory than several, as the amount of equipment required is reduced, less attendants are required and the results obtained are better. The site needs to be carefully selected, so as to be secluded but easy of access. A site near the guard room is often the best and its situation must be known to all ranks. When several units are quartered together, it is preferable that one room should be equipped and maintained by arrangements made between the units concerned. It is essential that the room selected should be of sufficient size, well lit, clean and smartly kept.

2. The equipment necessary to establish an efficient P.A. room is enumerated later, the cost of the articles being defrayed from the funds of the unit, except drugs, which will be supplied from the military hospital.

The lotion for irrigating should be potassium permanganate, 1/6,000, for washing the penis and parts, perchloride of mercury, 1/10,000, and the calomel ointment should contain $33\frac{1}{3}$ per cent. calomel and 0.1 per cent. oxycyanide of mercury.

3. The various processes should be arranged in series, together with directions for each in clear type and concise language placed above. The shelves and tables required can in most instances be provided out of the unit funds and authorized articles of barrack equipment.

4. In order to ensure effective supervision, at least two trained attendants should be placed in charge of each room to admit of one always being present. It is essential that these men should not be changed more often than is absolutely necessary.

5. It is recommended that a book with counterfoils (with details as in the specimen page given) be maintained. The orderly completes the counterfoil and initials the foil half, the latter being retained by the patient. By this method the patient possesses the only personal record made, as there is nothing on the counterfoil (without its foil) by which the identity of the user can be ascertained.

If infection develops, the patient produces the foil, while comparing the serial numbers and dates, the use of the P.A. room can be verified. The books of counterfoils, when completed, should be kept by the officer i/c the venereal disease section of the military hospital concerned.

Specimen page of book.

Counterfoil.	Foil.
Serial No.	Serial No.
Date.	Date.
Time since exposure.	Regimental No.
Remarks.	Orderly's initials.

6. Preventive packets are recommended as an additional precaution, and the value of their use before exposure as well as after should be stressed. These are supplied by the military hospital. Some units provide condoms in their P.A. rooms and show a decrease in the incidence of venereal disease in consequence.

List of equipment required for preventive ablution rooms.

Initial requirements.

- 2 white enamelled iron basins.
- 1 " " " jug.
- 1 " " " soap dish.
- 4 " " " bowls.
- 2 nail brushes.
- 1 urine tub.
- 2 white painted boxes for wool.
- 2 oil lamps (if electric light is not available).
- 2 tables.
- 4 metal Janet nozzles.
- 2 irrigating cans.
- 2 lengths of rubber tubing.
- 2 clips for tubing.
- 2 bottles for lotions.
- Books with counterfoils and pencils.
- Ointment jars.

Recurring requirements.

- 1 lb. soft soap monthly.
- 1 new nail brush monthly.

Directions.

Direction 1.—Take three pieces of wool from the box. Pour lotion into the bowl. Soak the wool in lotion and with one piece thoroughly wash the penis and parts round it. With the second piece wash the knob, ring and bridle string and with the third piece the mouth of the pipe. Throw the used wool into the bucket.

Direction 2.—Urinate. This should be done in gushes by pressing together the lips of the pipe, urinating and then letting go.

Direction 3.—Take a tube out of the left-hand bowl and insert it into the end of the rubber tubing, open the clip and let the lotion flow. Wash out the mouth of the pipe with the lotion. Close the clip. Take the tube from the rubber tubing and place it in the right-hand bowl.

Direction 4.—Thoroughly dry the penis with a clean piece of wool.

Direction 5.—Rub the ointment well in, especially into the knob, round the ring or girdle and the bridle string. Rub in for five minutes.

Direction 6.—Open the mouth of the pipe and insert a little ointment.

Direction 7.—Wash your hands and scrub your nails.

Direction 8.—Write on the ticket: Date and time of using the room. Time since having connection. Last four figures of your number. Get the orderly to initial your ticket, keep your half, *i.e.* the half with your number on it.

APPENDIX IV

PRÉCIS OF SUGGESTED LECTURE TO TROOPS
ON VENEREAL DISEASE**1. The venereal diseases.**

(a) *Short account of the main symptoms, etc., of syphilis, gonorrhœa and soft chancre.*

(b) The great danger of infection by illicit intercourse. The chance that all women who allow such intercourse are infected. The incidence of these diseases amongst the civil population.

(c) The results of infection :

(i) Syphilis.

To individual—paralysis, lunacy, etc.

To wife—miscarriage.

To children—congenital, deafness, etc.

(ii) Gonorrhœa.

To individual—rheumatism, stricture, etc.

To wife—chronic ill-health, salpingitis, sterility, etc.

To children—blindness, etc.

2. Preventive measures.

(a) *Abstinence.*—Intercourse not necessary for perfect health. Nocturnal emissions, in reason, not harmful. Warning against masturbation, perverted acts, etc.

(b) *Morals.*

(i) Personal morals.

(ii) Duty to the regiment—*esprit de corps*, upholding the military tradition of the regiment and not disgracing the uniform.

(c) *Value of keeping fit.*—Playing organized games and the avoidance of “pub crawling,” etc., in bad company.

(d) *Local measures.*

(i) The use of “condoms,” and the importance of carrying a P.T. outfit whenever a soldier leaves barracks so as to have it available in case of accidents, or of circumstances arising where self-control becomes too difficult.

The utmost importance of using the preventive measures before intercourse, *i.e.* “locking the stable door *before* the horse is stolen.”

(ii) The value of urinating immediately after intercourse and washing the parts with plain soap and warm water.

(iii) Detailed instructions in the use of the P.T. packets. The special value of these when used before intercourse.

3. Treatment of disease.—The absolute necessity for reporting sick *immediately* anything wrong is suspected. Delay in reporting sick a crime. The prospect of cure. The length of time taken and the nature of the treatment.

4. General advice.

Don't run risks. If you do, take precautions.

Don't delay an instant.

Don't get drunk in bad company.

Don't listen to advice on these subjects from your pals or any amateur doctors. When in doubt about anything sexual, always go and consult your medical officer.

APPENDIX V

DESCRIPTION OF INSTRUMENTS COMMONLY USED IN THE TREATMENT OF GONORRHŒA

1. Sounds (straight and curved).—These are also known as bougies. They are made of metal, gum elastic or other substances. The curved ones are shaped like a catheter, but are not pierced. They are called sounds because they were used to detect stones in the bladder. These sounds are marked to show the size. The effect of dilating the urethra by the use of sounds in the treatment of gonorrhœa is to cause newly-formed tissue to be absorbed and to prevent strictures forming, and to squeeze out the pus and secretion from the glands in the urethra. One can always massage the urethra on them.

2. Mechanical dilators.—The best known of these is Kollman's dilator. It is a metal instrument designed to carry out dilatation of the urethra. It has been stated that the meatus is the narrowest part of the canal and only exceptionally would the orifice admit the passage of a sound of a size of 28 to 30, Charriere's scale. The bulb of the urethra can often be dilated to 45, Charriere. This may be necessary in the treatment of cases of chronic gonorrhœa and sounds of such size would not pass the meatus.

The Kollman dilator, when closed, is of a convenient size, 22 to 24, Charriere, and consists of a central stem on which is carried the blunt, solid, acorn tip which guides the instrument in its progress down the urethra. Round the central stem are arranged three or four straight blades of metal which are carefully rounded in section to avoid injury to the mucous membrane and arranged to dovetail into each other when the dilator is closed. The blades are hinged at each end in such a manner that by turning a large milled screw at the top of the instrument (after it has been passed exactly as a sound) they can be made to open out, thus expanding the urethra.

The degree of dilatation is controlled by a dial face with a pointer which registers the scale number reached. The scale starts at the size of the closed instrument, say 22, and registers full expansion to 45. There are various types: straight dilators, for anterior urethra only, and curved dilators, for posterior urethra only and for both anterior and posterior

combined. They are further made in flushing and non-flushing types.

The flushing type has an inlet cock and a tap which is to be joined up to a fine rubber tube from an irrigating can. The fluid flows down the blades, which are pierced to allow it to enter the urethra ; this fluid finds an exit through an outlet tube in the instrument.

The advantage of flushing the urethra is :

1. It enables an antiseptic irrigation to be given whilst the urethra is accessible to fluid.

2. It permits of a higher degree of dilation as the elastic tissues are relaxed by the action of the warm fluid.

3. Observation of the return fluid will give warning of the occurrence of bleeding through overstretching, by which damage is done.

These dilators are very delicate instruments and are costly. They need careful attention to keep them in good order. Only the stem and blades—the part that enters the urethra—are boilable. After use, the stem and blades are boiled for ten minutes and then the channels of a flushing dilator are flushed with methylated spirit ; the hinges and joints are then vaselined and the instrument wrapped in clean white lint. All this should be done whilst the instrument is hot from the sterilizer. The milled screw should be oiled as necessary with ordinary lubricating oil. An alternative to vaselining is to keep the instrument immersed in a tall glass cylinder filled with preserving fluid (lysol, spirit, etc.) and to wash thoroughly in boiled water before use.

3. Urethroscopes.—These are instruments devised to enable the urethra to be viewed by the eye. All consist of three essential parts :

- (a) *The endoscope tube*—through which the view is obtained. This tube has a pilot—or *obturator*—which is a solid piece of metal with a blunt, torpedo shaped end. The pilot fits the endoscope tube exactly and in effect converts it into a bougie.

- (b) *The illuminant*—a small electric lamp which may be situated outside the tube (and have the light reflected by a mirror) or inside the tube and held on a long stalk.

- (c) *Magnifying apparatus*—this may simply be a lens or a small telescope.

Improvements have been added in recent years—bellows to balloon the urethra, special instruments for operating by direct vision, etc.

4. Kelly's foreign body forceps.—These are also called "*crocodile forceps*."

They are long forceps for taking foreign bodies out of the

urethra. They should always be available when the urethro-scope is used.

5. Cheatle's forceps.—These are for taking instruments, towels, etc., out of the sterilizer.

6. Meatome.—This consists of a small knife inside a guard which is passed into the meatus closed ; it is then opened to the desired extent and quickly withdrawn, cutting towards the floor of the urethra. It is used for cutting a narrow meatus to allow the passage of larger sounds.

General.—When preparing the instruments before the arrival of the medical officer, the orderly should boil all the metal ones for twenty minutes ; they should then be placed in a small shallow tray containing weak antiseptic which makes a clear solution—mercury salts should not be used ; carbolic, 1/80, is one of the best. The sounds should be laid out in ascending order from left to right and so should the urethro-scope tubes and their obturators. Gum elastic bougies should not be boiled ; they should be placed in a solution of perchloride of mercury, or biniodide, 1/4,000 ; they can then be dried and placed in a jar containing formalin vapour until wanted. Before use, they are placed in a weak antiseptic solution.

It must not be thought that because the gonococci or other germs have invaded the urethra, it is immaterial whether one introduces other kinds or not. Very dangerous germs are, or may be, carried into the urethra and even usually harmless ones may do much damage, when introduced into already damaged tissues. Such secondary infection must be regarded as a serious complication which may well delay the cure of the disease for weeks or months. As it is a preventable complication, it should not occur in any well-run treatment centre and its occurrence is a reflection on the work of the staff.

APPENDIX VI

LABORATORY METHODS FOR SPECIAL
TREATMENT ORDERLIES

1. Glassware.—Care of, cleaning, sterilization and making.

All glassware, before being used in the laboratory, must be carefully cleaned and sterilized. There are various kinds of glassware used and several methods of cleaning and sterilizing. The following methods are most commonly used :—

Microscope slides.—Used slides are put into 2 per cent. lysol until ready for cleaning. They should then be placed in the following solutions :—6 per cent. sulphuric acid (use concentrated commercial acid) and 3 per cent. potassium bichromate solution. Both are made up with tap water in sufficient quantity to cover the slides being cleaned. They are then boiled for an hour ; this sterilizes the slides and also cleans them. Care should be taken to flood off the floating scum of grease, etc., before the slides are removed. They are next washed in hot water and finally in cold tap water. After cleaning, they are stored in methylated spirit, being taken out and polished before use.

Test tubes.—All test tubes which have been used for culture media must be autoclaved at 120° C. for one hour ; this kills all bacteria and liquefies the culture media. After this the contents can be removed and the tubes washed with a brush and tap water. They are then boiled in strong soda solution, washed in tap water and placed in 6 per cent. hydrochloric acid, washed acid free in running water and placed to soak in distilled water. Finally, they are drained and placed in a hot-air oven to dry. The tubes are then plugged with cotton wool and replaced in the hot-air oven to sterilize at 120° C. for one hour. The temperature must not exceed 160° C., as the wool plugs will char above this temperature.

Flasks.—These are allowed to soak in a solution of potassium permanganate for twenty-four hours, they are then rinsed in 6 per cent. hydrochloric acid. They are then washed acid free in running tap water, and after being rinsed with distilled water, placed in the hot-air oven. When dry, they are

removed, plugged with cotton wool and sterilized in the hot-air oven at a temperature of 160°C . for one hour.

Petri dishes.—These are cleaned in the same way as test tubes ; after drying, they are wrapped in paper and sterilized in a hot-air oven at 160°C . for one hour.

Wassermann tubes (including Kahn tubes, etc.).—These must on no account be cleaned with acid, as the slightest trace of acid will spoil the test. After use, all these tubes must be washed in tap water and allowed to remain in water all night. Each tube is then cleaned by means of a small plug of gauze and finally thoroughly washed in distilled water and placed, inverted, in tins to drain. Dry and sterilize in the hot air oven. It must be borne in mind that all glassware used in these tests must be chemically clean, that is, free from all trace of chemicals, acid or alkali.

The making of pipettes.—Pipettes are made with $\frac{1}{4}$ -inch glass tubing, cut into lengths of about 6 in., heated over a bunsen burner or blow-pipe ; the centre part of the tubing only being heated. When the centre portion is molten, remove it from the flame and draw out until a capillary tube about 10 in. long is formed. Break in the centre, seal off in the flame, plug the other end with wool and sterilize in the hot-air oven.

2. The microscope.—This consists of a system of lenses so arranged as to give maximum magnification of any given object.

It has the following parts :—

1. *The stand*.—This keeps it in a firm position.
2. *The mirror*.—This reflects the light on to the condenser.
3. *The substage condenser*.—This concentrates and focuses the light on to the object.
4. *The iris diaphragm*.—This controls the amount of light passing through the condenser.
5. *The objective lenses*.—These are a series of lenses of different magnification contained in a cone-shaped metal casing. They screw into a carrier or “nose piece,” which revolves on the base of the barrel. These lenses are very delicate and costly, and, after use, they must be carefully cleaned with silk material and replaced in the special boxes provided with them. Sizes are arranged according to the distance at which they focus from the object examined—*i.e.* $\frac{1}{12}$, $\frac{1}{6}$, $\frac{2}{3}$, etc. The $\frac{1}{12}$ is known as the oil immersion because it has to be used in a bath of oil.
6. *The barrel*.—This is the tube up which the light is directed.
7. *The eye-pieces*.—These consist of tubular metal cases

containing lenses of different magnification. One is slipped into the top of the barrel and it is this that the examiner looks into.

8. *The stage*.—This is the platform on which the slide to be examined is put, and usually there is fixed to it a mechanical stage by which the slides can be moved in any desired direction.

9. *The coarse adjustment*.—This is for rough focusing of the object.

10. *The fine adjustment*.—This is for focusing the object more accurately after use of the coarse adjustment.

Items 2, 3 and 4 are known as the lighting system, items 5, 6 and 7, the optical system, and items 1, 8, 9 and 10 the mechanical system.

3. Special points for the preparation of the microscope for dark ground examinations.—See para. 85.

(a) Centre the light on the mirror.

(b) Focus the condenser until two concentric rings on the surface are seen. These rings must be brought into the centre of the field by means of the small adjusting screws on the side of the condenser carrier.

(c) Lower the condenser.

(d) Place distilled water or cedar wood oil on the condenser.

(e) Put the slide on the stage and slowly raise the condenser until the water or oil touches it—no bubbles must be allowed.

(f) Focus with the 2/3 lens.

(g) Focus the point of light on the slide by raising or lowering the condenser.

(h) Put a drop of oil on the cover slip and examine with the 1/12 objective.

Note.—Great care must be taken that the microscope is cleaned thoroughly before and after use. The condenser must always be lowered when the microscope is not in use.

4. Preparation, fixing and staining of smears.—In cases where there are a large number of patients, each patient should be given a number. Great care should be taken not to get the numbers confused. The corresponding number should be marked on the slide with a grease pencil.

Method of taking smears.—The prepuce should be drawn back and the glans penis cleansed by washing in a solution of sterile normal saline. Take a platinum loop, sterilize it by passing it through the flame, and, when cool, take a loopful of pus from the lips of the meatus and deposit it on the centre of the appropriately numbered slide. Take another slide (usually called “the spreader”) and apply one end of it to

the drop and spread an even smear. Care should be taken to clean and sterilize the spreader after each case.

The next step is to allow the smear to dry in the air. When it is thoroughly dry, fix it by passing the film side through a naked flame, taking care not to overheat.

Gram's method of staining.—The stains required are :—

(i) 0.5 per cent. aqueous solution of methyl violet (6B).

(ii) Strong Lugol's solution—iodine 1 part, potassium iodide 2 parts, distilled water 100 parts. Iodine is nearly insoluble in water but is freely soluble in a solution of potassium iodide. Hence, in making up the solution, dissolve the potassium iodide in a few c.c. of distilled water; then add the iodine and finally make up to the required amount. Gram's iodine is the same solution diluted to 300 parts instead of 100.

(iii) Absolute alcohol (98 per cent.).

(iv) Counter-stain—either neutral red 1 part, 1 per cent. glacial acetic acid 2 parts, distilled water 1,000 parts, or carbol-fuchsin, 1 in 10, made up as follows :—fuchsin 1 part, absolute alcohol 10 parts, acid carbol liq. 100 parts—dilute to 1 in 10 with distilled water immediately before use.

The method of staining films, which must be thin and even, is as follows :—

(i) Let the slide cool after fixing by heat.

(ii) Stain with the methyl violet solution for half a minute.

(iii) Pour off the methyl violet and wash off the surplus with a few drops of Lugol's solution.

(iv) Pour on fresh Lugol's solution and leave for $\frac{1}{2}$ min.

(v) Wash off Lugol's solution with absolute alcohol.

(vi) Pour on fresh absolute alcohol, moving the slide from side to side as if developing a photo film. A third quantity of alcohol may be required to complete decolorization. Do not decolorize beyond 1 minute.

(vii) Rinse with a few drops of absolute alcohol followed immediately, without washing in water, by the counterstain, and let act for half a minute.

(viii) Wash in tap water, dry with blotting paper and in air.

With this stain, certain organisms retain the methyl violet and appear dark purple or black—these are “Gram-positive”—whilst others do not retain it and appear red like the cells, etc.—these are “Gram-negative.” Gonococci are Gram-negative.

The limitations of Gram's method in relationship to the diagnosis of gonorrhœa should be noted :—

(1) That Gram-positive organisms, when taken up and digested by leucocytes, may lose their Gram-positive character.

(2) That more than one observer has noted, in cases of chronic gonorrhœa in which the body fluids are acid in reaction and in which the material is such that a satisfactory film is difficult to obtain, that organisms, determined by culture to be gonococci, retain the violet stain with unusual obstinacy and appear thus to be Gram-positive.

(3) That the stain as such does not distinguish between gonococci and other Gram-negative diplococci, such as the *micrococcus catarrhalis*, which may be present in both male and female genito-urinary tracts.

The Medical Research Council, however, "are of opinion that these limitations do not seriously affect the diagnosis of the one order of cases in which, in their view, diagnosis by microscopical examination alone gives consistent results, namely active acute cases of the disease."

5. Incubators.—The incubators usually found in laboratories are made by Hearson and are heated either by electricity or by gas. In each incubator (on the inside of the middle of the door) is a list of instructions for its regulation. A uniform temperature is automatically obtained and maintained at 37° C. by means of a capsule and an adjustable weight on a sliding bar. Great care must be taken to prevent undue jarring or shaking, as this is liable to increase or decrease the temperature, owing to moving of the weight. If the incubator is in continuous use, it should be frequently washed out with lysol, 2 per cent.

6. Water bath.—These are of various shapes and patterns. The principal ones used automatically maintain a temperature of 37° or 56° C., the temperature being regulated by means of a capsule. They may be heated either by gas or electricity. They are made to hold racks of tubes of different sizes and various numbers. They are filled with water to a depth of 4 to 5 in. ; this water should be changed at least every week. They are used for serological work, such as Wassermann tests, Kahn tests, Dreyer's agglutination tests, etc.

7. Stills.—This is the laboratory name for the distilling apparatus. The principles of distillation are :—The raising of water to boiling point and the collection and cooling of the steam. Steam thus cooled condenses and turns again into water. Such water is very pure and free from all salts and suspended matter, which are always present in tap water. There are various types of stills in use. Stills require constant care and attention and must be thoroughly cleaned at regular intervals.

8. Ice chest.—This is a zinc-lined chest fitted with shelves, used for the purpose of storing serum, blood, cultures, etc.,

at a temperature below room temperature. A regular supply of ice must be maintained; otherwise it will not fulfil its purpose. It should be cleaned thoroughly at least once a week, by being washed with soda water and then a 2 per cent. solution of lysol. There is a hole at the bottom of the chest to allow ice water to run out to waste; a basin should be placed under the ice chest to collect this. In many hospitals nowadays, especially in the tropics, various forms of refrigerators of the "Frigidair" type are used in place of the old-fashioned ice chests. The majority of these work by electricity. It is just as essential to keep these clean as it is ice chests.

9. Hot-air ovens.—These consist of an outer and an inner case of sheet iron. In the bottom of the outer case is a large hole under which is placed a bunsen burner. The heat evolved from the burner rises between the two cases and passes out of the top by way of two holes. A thermometer is placed in an opening in the top, passing through the two cases to the inner chamber. By this means the temperature of the oven can be ascertained. The interior is fitted with two shelves. Sterilization by heat is used for all glassware, both new and old, as a temperature of 200° C. can be maintained. It is not suitable for media. Care must be taken that the cotton wool plugs of tubes, flasks, etc., do not touch the sides of the oven, as the plugs may tend to scorch and burn. When sterilization is completed, never open the door until the temperature has subsided a little, as sudden reduction in temperature may cause the glass to crack. Never allow the temperature to rise above 160° C. when sterilizing glassware with cotton wool plugs, as the plugs will burn above this.

10. Autoclave.—This is a metal cylinder (usually gun-metal), supported in a cylindrical sheet iron case, the top of which is fitted with a lid fastened by bolts and screws. The top is fitted with a pressure gauge and safety-valve and underneath is a gas-ring or a Primus stove. Inside the metal cylinder is a wire cage to contain the articles to be sterilized. The bottom is half filled with water. When the lid is screwed down and the gas lighted, the water boils and the pressure is raised inside owing to the expansion of the steam. By this means, the temperature can be raised to 125° C. After heating for one hour, it is allowed to cool down to about 60° C. before it is opened. Always ascertain that the bottom is half-filled with water before use. Never remove the lid until the temperature has fallen below 60° C. See that the safety-valve is open until a good steady flow of steam is coming over. If the pressure is too great lower the gas a little.

11. Steam sterilizers.—The steam sterilizer usually seen in the laboratory is known as the “Koch steam sterilizer.” This consists of a felt or asbestos covered copper cylinder on a stand, fitted with a movable top in which is a small hole for a thermometer. A gas-burner is fitted underneath. Inside is a perforated shelf or diaphragm, above the level of the water. It must be borne in mind that the highest temperature obtainable is 100°C . It is used for sterilizing media, etc.

12. Method of weighing with a chemical balance.—Adjust the balance before use. This is done by means of small screws at the ends of the beam. Place the chemical to be weighed on the left-hand pan on filter paper or a previously weighed watch glass. The required weight is placed in the right-hand pan, by means of the forceps provided in the weight box. Never use the fingers to handle the weights. Do not raise the beam, which is operated by a small handle in the front of the balance, until the weight on the pan is nearly correct; then raise the beam and note the direction of the pointer. If it swings to the right, lower the beam and add more chemical. When the correct weight of chemical is present, the pointer swings an equal number of divisions each way.

When weighing is complete, remove the chemical from the pan, wipe the pan and replace it; next replace the weights in the box, taking care to place them in their proper compartments. Take great care in using the balance, which is an extremely delicate instrument and easily put out of order.

13. The Metric system.—The metric system of measurements is used in laboratories and the following is a table of metric weights and measures showing the equivalent weights, etc., in avoirdupois.

1 Grain	...	=	0.648 Gramme.
15.432 Grains		=	1 Gramme.
1 Ounce	...	=	28.35 Grammes.
1 Pound...	...	=	453.6 Grammes.
$2\frac{1}{4}$ Pound (approx.)		=	1 Kilogramme.
1 Minim	...	=	0.059 Cubic centimetre.
16.9 Minim	...	=	1 “ “
1 Ounce	...	=	28.412 “ “
1 Pint ...	...	=	568.245 “ “
1 Pint		=	1,000 (1 litre) Cubic centimetres.
(and 15 oz. (approx.)			
1 Gallon...	...	=	4.546 Litres.

APPENDIX VII

FORMULÆ AND USEFUL INFORMATION

1. Mist. Alkalina.

R

Alkaline sodium phosphate	...	...	oz.	3
Tr. hyoscyamus	...	...	drs.	4
Aquam.	...	...	ad. oz.	12

2 to 3 tablespoonfuls in water thrice daily after food.

(Or when alk. sod. phos. is not available :—

R

Sod. bicarb.	...	...	...	drs.	6
Pot. bicarb.	...	...	...	„	4
Pot. cit.	...	...	...	„	5
Tr. hyoscyamus	...	...	...	„	4
Sp. chloroform	...	...	...	„	3
Inf. buchu.	...	...	ad.	oz.	12

2 tablespoonfuls in water thrice daily after food.)

An alkaline diuretic in all cases of gonorrhœa and acute urethritis.

2. Mist. alkaline and belladonna.

R

Tr. belladonna	...	...	...	dr.	1
Mist. alkalina	...	...	ad.	oz.	12

2 tablespoonfuls in water thrice daily after food.

An alkaline diuretic and antispasmodic in cases of posterior urethritis, prostatitis and vesiculitis.

3. Mist. Santal co.

R

Ol. santal wood	...	...	...	oz.	2
Ol. pimento	...	...	...	drs.	2
Ol cassia	...	...	...	„	1
Morphine acetate	...	...	...	grs.	4
Alcohol, 90 per cent.		...	ad.	oz.	6

 $\frac{1}{2}$ to 1 teaspoonful thrice daily in warm milk after food.

A sedative mixture to be taken only in severe posterior urethritis with hæmaturia and in hyperpurulent cases.

4. Mist. Tres.

R

Syr. ferri iod.	...	...	...	}	aa	drs.	4
Syr. hypophos co.	...	...	...	
Syr. glycerophos co.	...	...	...	
Aquam.	...	...	...		ad.	oz.	12

2 tablespoonfuls thrice daily after food.

Tonic, useful in chronic gonorrhœa or in intervals in treatment of syphilis.

5. Pulvis Camphor monobromate.

R

Camphor monobromate	...	...	grs.	5
(In a cachet.)				

One to be taken at 6 p.m. and one at bedtime.

Useful to control painful erections.

6. Glycerine of belladonna.

R

Extr. belladonna viride	...	...	oz.	1
Glycerine	...	...	„	2

A local application in epididymitis.

7. Mill's Paint.

R

Liquor arsenicalis	...	...	...	oz.	1
Vin. ipecac.	...	...	...	„	1
Spt. vin. rect.	...	...	...	„	2

A useful application in Vincent's angina and venereal warts.

8. Wart paint.

R

Liquor ferri perchlor. fort.	...	}	aa	pts. æq.
Liquor epispasticus	...			

A good application for venereal warts, but healthy parts must be protected with vaseline.

9. Mist. pot. iod.

R

Pot. iod.	...	...	...	...	drs.	5
Sod. bicarb.	...	...	...	...	„	2
Spt. ammon. aromat.	...	...	...	...	„	2½
Aquam.	...	...	...	ad.	oz.	8

1 tablespoonful in water thrice daily after food.

In intervals of specific treatment for syphilis.

10. Glucose drink.

R

Glucose	...	...	...	...	drs.	14
Sod. bicarb.	...	...	...	...	grs.	15
Ol. limonis	...	...	...	...	min.	1
Aquam.	...	...	...	ad.	oz.	3

or,

Dissolve $1\frac{1}{2}$ lb. of cane sugar in $2\frac{1}{2}$ pints of water. Give 3 oz. of the first or 4 oz. of the second half an hour or so before an arsenical injection as a routine.

11. Suppositories.

R

Atropine sulph.	...	...	...	grs.	$\frac{1}{75}$
Extr. belladonna	...	...	...	„	$\frac{1}{4}$

or,

Atropine sulph.	...	...	...	„	$\frac{1}{75}$
Morphine tart.	...	...	...	„	$\frac{1}{8}$

or,

Atropine sulph.	...	...	...	„	$\frac{1}{75}$
Acetanelide	...	...	...	„	4

or,

Atropine sulph.	...	...	...	„	$\frac{1}{75}$
Ichtyol.	...	...	...	„	5

All are made up with a sufficient quantity of ol. theobromine. In acute prostatitis, vesiculitis, etc.

12. Lotio "A.B.C."

R

Phenol.	...	...	...	...	drs.	2
Exsiccated alum.	...	...	...	„		1
Boric acid	...	...	...	„		$\frac{1}{2}$
Ol. menth. pip.	...	...	...	mins.		5
Distilled water	...	...	ad.	oz.		10

1 oz. to be added to 2 pints of warm water.

Useful douche in chronic cervicitis and vaginitis.

13. Pulvis conspersus.

R

Zinc oxide in fine powder	...	...	...	drs.		1
Bismuth subgallate	...	...	...	„		2
Mag. carb. levis	...	...	...	„		2
Starch in fine powder	...	ad.	oz.			1

To be lightly dusted on the parts after douching or light swabbing.

Useful in all cases of vulvitis, vaginitis and cervicitis.

14. Gargarisma potas. chlor. co.

R

Potassium chlorate	...	...	...	drs.	2
Purified alum.	...	...	...	„	2
Glycerine of borax	...	...	...	oz.	1
Distilled water	...	...	ad.	„	8

To be used with equal parts of hot water.

Useful as an astringent and antiseptic gargle in sore throat and in stomatitis.

Useful Data

1. In making up lotions for irrigations, etc., it is found most convenient to prepare them in concentrated form of such strength that 1 oz. to 1 pint of warm water gives the required dilution—*i.e.* pot. permang. should be made up 14 grs. to 32 oz. of water. 1 oz. of this solution to 1 pint of warm water gives a strength of 1/20,000.

2. To determine the amount of a drug required to make a given strength in solution, it should be noted that liquids are measured at 480 min. to the ounce and solids at 437.5 grs.

The following equation gives the amount of drug required for a given quantity of solution :—

$$A \times B \times C = W.$$

Where,

A=480 or 437.5 (liquid or solid).

B=the amount of solution required.

C=the strength of solution required.

W=the weight of the drug in grains or the volume in minims.

E.g. If it is required to make up a 1/1,000 solution of pot. permang., the equation reads :—

$$437.5 \times 32 \times 1/1,000 = 14 \text{ grs.}$$

Thus, 14 grs. of the drug are required to make up 32 oz. of a 1/1,000 solution.

3. Conversion of Imperial to metric weights :—

1 lb. avoirdupois = 453·59 grammes.

1 kilogramme = 2·2 lb.

1 stone	= 6·35 kilos.	2 stone	= 12·7 kilos
1 „ 2 lb.	= 7·25 „	2 „ 2 lb.	= 13·6 „
1 „ 6 „	= 9·0 „	2 „ 6 „	= 15·4 „
1 „ 10 „	= 10·88 „	2 „ 10 „	= 17·23 „
3 „	= 19·0 „	4 „	= 25·4 „
3 „ 2 „	= 19·95 „	4 „ 2 „	= 26·3 „
3 „ 6 „	= 21·77 „	4 „ 6 „	= 28·1 „
3 „ 10 „	= 23·58 „	4 „ 10 „	= 29·9 „
5 „	= 31·75 „	6 „	= 38·1 „
5 „ 2 „	= 32·66 „	6 „ 2 „	= 39·0 „
5 „ 6 „	= 34·47 „	6 „ 6 „	= 40·82 „
5 „ 10 „	= 36·28 „	6 „ 10 „	= 42·64 „

7 stone = 44·45 kilos.

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A

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